This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google™ books

https://books.google.com

41

Harvard University

Library of

The Medical School

and

The School of Public Health

The Gift of

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Vol. I. JULY, 1913 No. 1.

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND Preventive Medicine

Official Organ of The American Society of Tropical Medicine.

Edited by CREIGHTON WELLMAN, M. D.

SAPERE AUDE

Published Monthly by the American Journal of Tropical Diseases Co., Ltd.

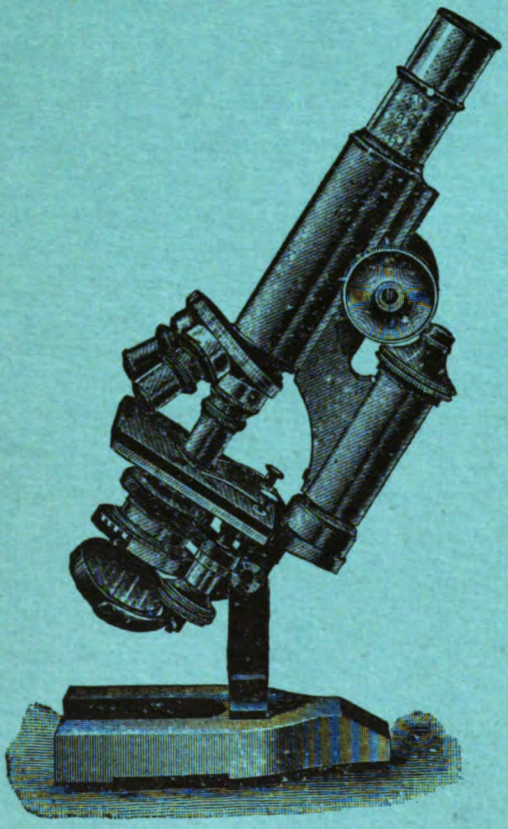
NEW ORLEANS

Digitized by Google

HARVARD UNIVERSITY
SCHOOL OF MEDICINE AND PUBLIC HEALTH
LIBRARY
41

MICROSCOPES

Microscopical Supplies
LABORATORY EQUIPMENT



Chemical Glassware; Slides;
Cover Glasses; Stains; Etc.

We Sell All the Standard Outfits—

Leitz - Spencer
Bausch & Lomb

We are Distributors as well
of the

"TYCOS" AND FAUGHT BLOOD
Pressure Apparatus

Manufacturers of the

CAINE-McDERMOTT
Warm Ether Apparatus;
MATAS Jaw Splint;
MATAS Infiltration
Anesthesia Apparatus; Etc.

WRITE FOR CATALOGUES OR
DESCRIPTIVE CIRCULARS . . .

The McDermott Surgical Instrument Co., Ltd.

734 to 738 POYDRAS STREET

NEW ORLEANS, LA.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CREIGHTON WELLMAN, M. D. ..... EDITOR-IN-CHIEF
CHARLES CHASSAIGNAC, M. D.
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine
JOHN M. SWAN, M. D., Secretary, American Society of Tropical Medicine } *Ex officio*
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
ALLEN J. SMITH, M, D., University of Pennsylvania.
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. JULY, 1913 NO. 1.

EDITORIAL

The American Journal of Tropical Diseases and Preventive Medicine.—The importance of special study in preventive medicine has loomed large for many years, but only in recent years has any practical effort obtained through which such a field might be brought into effective usefulness. While all educators in medicine, honestly inspired, have preached the doctrine of preventive medicine, the application of such didactic essay has been absent.

To-day this has changed and in the clinic, laboratory and in the field, preventive medicine is the slogan with which the profession of medicine meets the enemy, disease. In standard schools, preventive medicine is taught as a required subject and the scope embraces the instruction in all forms of immunization and protection against disease. Even as a new disorder is discovered, a prompt effort is made to derive a laboratory weapon which will discount its evils.

Digitized by Google

MARYLAND UNIVERSITY

The place then of preventive medicine is well established among scientists in this field, and the work must grow until the public health problems are reduced to routine practices and until every community recognizes the importance of qualified supervision of the community well-being, from the standpoint of disease. Foods, water, and even air, are materials of concern in the general question which also embraces the study of morbidity, mortality, epidemiology, and the elements, as well, of medicine and sanitation that affect the comity of people of one or more countries.

The education of the profession has only begun and the education of the public must follow. Almost as a necessary corrollary of Preventive Medicine has come the study of tropical diseases. Formerly altogether exotic, many of these diseases have planted themselves long enough to have scourged some sections of our country, and if the toll from yellow fever, uncinariasis, pellagra and malaria were totalled, the appalling figures would stagger belief and would more potently than any other argument plead for a wide concern in the future prevention of such diseases.

The pioneers in preventive medicine attacked these diseases particularly in their investigations, and the monumental discoveries of the martyrs to yellow fever elucidation started the modern concept of the importance of this field.

Stray rays of genius have filtered through the past century, illuminating the darkness of speculation in the etiology of epidemic diseases of tropical nature, and the coördination of these has fixed the mosquito, flea, rat, bedbug, and fly, as culprits in the etiological groups.

We need more light, and the association of our profession in interest in these problems means the final solution of many of them. We have believed, therefore, that the time is here for some medium through which American workers might express

Digitized by Google

themselves. To that end THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE is to-day presented to the profession, as the exponent of the American Society of Tropical Medicine and as the ready medium for all men who have a message of science or of note through which the field of preventive medicine may be furthered or through which the newly opened subject of tropical diseases may be elucidated.

We, then, extend greeting to all men, particularly to those who lead and to those who follow in the inspired ways of medicine, a mistress demanding honesty and virtue and promising the reward of a consciousness in success, which is as high as honor earned in any field of conflict. *Sapere aude!*

Isadore Dyer.

The Tenth Annual Meeting of the American Society of Tropical Medicine.—This meeting, held at Washington in conjunction with the Congress of American Physicians and Surgeons, was one of the most successful and significant in the history of the Society. The papers read represent valuable research in several important directions and the discussions contain the opinions of men whose special study and experience lend weight to their conclusions.

The President's address on "The Value of a Course in Tropical Medicine for the Training of the Internist" struck a practical note that was maintained throughout the session. In the Secretary's report, the history of the Society was told in some detail, and the achievements of its first decade reviewed. The subjects of the papers were varied and illustrate well the wide range of interest of the Society. Among the subjects discussed were Physiologic Activity in the Tropics, Ulcerating Granuloma, Malta Fever, Trypanosomiasis, Mosquitoes, Malaria, Beri-beri, Pellagra, Intestinal Parasites, Filaria, Sprue and

Digitized by Google

Amœbae. The papers and discussions will be presented to our readers in this and succeeding issues.

The Society enters its second decade of existence with bright prospects of usefulness, and to this wider usefulness we hope that its official JOURNAL will contribute in no small degree.

Creighton Wellman.

Emetine in Amebiasis.—The medical profession by long experience has learned to adopt a conservative if not skeptical attitude when confronted by an alleged new specific for a serious disease. In emetine, however, it appears probable that we have a remedy that will prove to be of the greatest value in the treatment of amebic dysentery, especially in its early stages.

There are in the medical literature references to the use of this drug long before the present day reports. For instance, Foy[1] has pointed out that Bardsley employed emetine with good effect as early as 1829. Again Walsh[2] in 1890 administered the same drug in dysentery with marked success.

The recent work of Rogers,[3] Vedder,[4] Lawson,[5] Chauffard,[6] Allan,[7] Flandin and Dumas,[8] Costa,[9] Dopter,[10] Lyons,[11] and others has, however, focussed interest on this subject and the results secured are both surprising and gratifying.

The original observations of Rogers brought out the fact that

(1) Lancet, 1912, November 2, p. 1242.

(2) Indian Med. Gaz., 1891, September, p. 269.

(3) Brit. Med. Jl., 1912, June 22, pp. 1424-1425, *ibid.* 1912, August 24, pp. 405-408; Lancet, 1912, October 19, pp. 1062-1067; Indian Med. Gaz., 1912, November, pp. 421-427; Therapeutic Gaz., 1912, December 15, pp. 837-842; Lancet, 1913, January 11, p. 129.

(4) Far Eastern Assn. Trop. Med., Trans. 2nd Biennial Congress at Hongkong, 1912, pp. 87-91.

(5) Brit. Med. Jl., 1912, September 28, pp. 793-794.

(6) Bull. de l'Acad. de Méd., Paris, 1913, February, pp. 122-131; Buls. et Méms. Soc. Méd. des Hôp. de Paris, 1913, March 20, pp. 599-605; *ibid.*, April 17, pp. 753-758.

(7) Jl. Amer. Med. Assn., 1913, March 1, pp. 664-665.

(8) Bulls. et Méms. Soc. Méd. des Hôp. de Paris, 1913, March 13, pp. 630-633.

(9) *Ibid.*, April 17, No. 12, pp. 746-751.

(10) *Ibid.*, April 10, No. 11, pp. 686-689.

(11) Journal of A. M. A., vol. lx, No. 16, April 19, 1913, pp. 1216-1220.

Digitized by Google

ipecacuanha sine emetina exerted no amebicidal action, but that emetine salts and cephaelin killed cultures of ameba in dilutions of 1 to 100,000. Experiments were then made on animals which showed that, while cephaelin caused violent vomiting and great depression even in minute doses (0.1 gram), emetine gave rise to no symptoms whatever. Vedder and Rogers both carried these investigations further and a number of other workers have agreed in the first observations that emetine hydrochloride or hydrobromide administered hypodermically in cases of amebic dysentery causes rapid improvement of the symptoms, a fall in the number of leucocytes and the disappearance of amoebae from the stools. Amebic hepatitis and abscess have also been treated with good results.

The dose of the hydrochloride, which is the most valuable and the salt usually employed, ranges from 2⅓ to 3 grains a day and the length of treatment from 2 to 20 days. As a rule, the dose given varies from ⅝ to ¾ grain and the treatment is carried out in 3 or 4 days.

The lack of untoward symptoms from its administration and the rapid and satisfactory results suggest that we have in the salts of emetine an ideal method for the treatment of amebic dysentery. The enthusiasm of those who have employed the drug is well represented by the opinion of Rogers, who believes that we have here a specific agent which will play as important a rôle in the treatment of amebiasis as quinine does in the destruction of malarial plasmodia.

Creighton Wellman.

Digitized by Google

ORIGINAL ARTICLES

THE VALUE OF A COURSE IN TROPICAL MEDICINE FOR THE TRAINING OF THE INTERNIST.*

EDWARD R. STITT, M. D.,
Medical Inspector U. S. Navy, Washington, D. C.

In considering the subject under discussion, the first requisite is to determine what is considered by leading authorities as most desirable in connection with internal medicine.

This matter is probably more explicitly set forth in the two reports of the Carnegie Foundation on Medical Education in the United States and Canada, and Medical Education in Europe, than elsewhere. In these reports Mr. Flexner quotes from numerous authorities, European as well as American. As to the importance of internal medicine these two volumes contain frequent declarations stating that the foundation of all clinical teaching is the clinic in internal medicine, and that there is no substitute for a good clinic. Any course of instruction wanting in this respect suffers from a fatal organic lesion.

As regards the proper organization of this clinic these reports emphasize the absolute interdependence of the bedside and the laboratory. In one place, we read that to thoroughly understand the phenomena of disease relationship between the bedside and the laboratory is essential. Moreover, in an intensely practical training the student not only becomes familiar with the features of a case at the bedside, but likewise with the laboratory findings, so that he is able to correlate and utilize the two sets of evidence. Further, a clinic of medicine needs a laboratory equipped with apparatus for chemical, physiological,

*Presidential Address. Read at the Tenth Annual Meeting of the American Society of Tropical Medicine, held at Washington, May 6, 7, and 8, 1913.

Digitized by Google

pathological and bacteriological work, and the laboratory must be readily accessible.

In emphasizing the superiority of the training in internal medicine as given in Germany it is observed that the German internist studies disease not from one standpoint, but from many. Not only does he weigh the evidence obtained at the bedside, but he considers, as well, the view that the patient takes of his own case as elicited from the subjective symptomatology. Such evidence is weighed and confirmed by laboratory observations, including X-ray photographs as well as examinations of the various body fluids and excretions.

In contrast to this approved type of internist, who combines in himself physician, psychologist and laboratory worker, we have given us pictures of a group of physicians, not internists, who give up the laboratory and with it the laboratory state of mind. In their conception of the medical man the laboratory evidence is only of value when it does not disagree with the diagnosis already decided upon at the bedside. To this type of medical man, bacteriologists, pathologists and other laboratory workers are the servants rather than the peers of the physician.

That we have such men in our own country there is ample evidence. But a feature of the case which must impress even these decriers of the laboratory is the number of men who originally gained reputations as laboratory workers and have since divided their medical effort between the laboratory and the bedside. This class of workers have not only become peers of the more limited man, but superior. Breadth of conception and ability to utilize every factor in diagnosis have made them not merely physicians, but internists.

The next point to consider in our discussion is whether the study of tropical medicine is one of sufficient interest and advantage to the resident of temperate regions to justify the time which would thereby be consumed. As regards the question of medical interest, one need only consider the investigations of Robert Koch. In him the medical profession had a representative who touched and illuminated every phase of internal medicine; and while his epoch-making researches as to the etiology and therapeutics of tuberculosis are recalled at the mere men-

Digitized by Google

tion of his name, it will probably come as a surprise to those not especially interested in the diseases of the tropics to learn of the great achievements of this master of medical science in the realm of tropical medicine. His discovery of the spirillum of cholera, in the course of his researches into the etiology of this disease in Egypt and India, is certainly second only in importance to his demonstration of the tubercle bacillus as the cause of tuberculosis. When we think of the terrible ravages of cholera, the disease best characterizing the so-called Genus Epidemicus, and, with the medical world helpless in controlling this scourge, and groping in the darkness of ground water and ground air, we can appreciate the value of what Koch did in 1883, in giving us a scientific foundation for epidemiological investigations and measures of control of the spread of this disease.

While in the history of the advance in knowledge of malaria we have in mind chiefly the names of Laveran, Golgi and Ross, yet it is a question whether their discoveries in this most important disease of the tropics equal in value the work of Koch. It is to Koch, with his rare power of combining clinical investigation with laboratory findings, constantly checking and controlling the former by the latter, that we owe our present exact knowledge of the species of malaria. It was not by working in one country that he accomplished this, but by careful studies in Italy, Africa, Batavia, and New Guinea.

We find Koch at the head of the German Plague Commission in India, and to him we are indebted for the knowledge of a plague focus in Uganda, from which probably spread the epidemics of former centuries in Egypt. While Koch was investigating cholera in Egypt he became impressed with the significance of the invasion of the submucosa by amoebae. This was the real incentive which later led Kartulis to the notable investigations concerning amoebae with which the name of the latter is so prominently associated. It is to Koch that we owe the demonstration of the spirochaetae of African tick fever in the ovaries and ova of the infected ticks, thus showing hereditary transmission. In this connection it must be remembered that Leishman

Digitized by Google

has not been able to find any evidence of spirochaetes in the ova of infected ticks, but only granules.

As to sleeping sickness, the epidemiological and therapeutic considerations given by Koch to our knowledge of this important African scourge are too recent and too well known to make any statement necessary.

If Koch found in tropical medicine a field so worthy of his endeavor, why should not every internist find similar interest in the diseases of the tropics?

The advantages of a study of the diseases of the tropics are many. From the altruistic standpoint the medical man who knows the relative importance and methods of prophylaxis of the diseases which bear heavily upon the native inhabitants of our tropical possessions is in a position better to perform his duty as a citizen.

Again, the practitioner who knows the pathogenic possibilities residing in the home returning soldier or sailor is in a position to check at the earliest moment the progress of any infection which might through this source be introduced. Furthermore, the commercial interests of a community can best be protected by the medical man who understands the epidemiology of tropical diseases, so that scientic safeguards may be adopted, instead of hysterical and expensive blunderings, at the time of a scare of an epidemic.

Then we must consider the store we set by any diagnosis of an unusual or rare disease. It gratifies our self-satisfaction, and is recorded in our mental impressions as a personal achievement. It must be that many puzzling cases in our Northern clinics escape a diagnosis because the one in charge of the case has not been in a position to let pass before his diagnostic horizon the various, more or less common, tropical affections.

Coming now to the immediate subject of this address, let us consider wherein a course in tropical medicine would be of benefit in the training of the internist. In my opinion, these advantages rest in the fact that in temperate climates we make our diagnoses at the bedside and use the laboratory as a control; the laboratory is a check, not the essential feature in the diagnosis. In the tropics, however, we make our diagnosis in

Digitized by Google

the laboratory, and the bedside plays a subsidiary part. We control the laboratory diagnoses by the bedside findings; even when dealing with a disease for which the laboratory does not furnish a diagnosis; we have diagnosis by exclusion.

As a result, there is a greater application of laboratory methods than is the case in the internal medicine of temperate climates. And if we are to believe that internal medicine at its best is a thorough correlation of bedside observation and laboratory finding, would it not be well to have in the training of the internist an alternation of a course where the laboratory was pre-eminent in the course, and following this, where the bedside was of greater importance?

Another valuable feature of a training in tropical medicine is that the finding of one condition does not justify one in accepting it as the cause of the patient's illness.

We all know how rare it is in temperate climates to find definite pathological conditions in people who are apparently well. In such people a definite finding of a cause sufficient to account for an illness is usually the key to the diagnosis. With those from the tropics, however, it is different. A single individual may be found upon examination to have amoebiasis, malaria, filariasis and syphilis, yet none of these infections prevent him from following his usual occupation. When such a patient comes to the ward it requires a correlating mind to eliminate four or five definite diagnoses, and fix upon some disease which is common to both tropics and temperate climates, as for example, typhoid fever. There seems to be an idea with men first going to the tropics that the types of diseases to be met with will be those classed as tropical. As a matter of fact, the common diseases of temperate climates, such as tuberculosis, kidney disease, and pneumonia, are as common in the tropics as farther north, so that the pathologic range is simply extended—there is no curtailment of affection with which we are familiar in temperate climates.

Furthermore, in studying the majority of tropical diseases one necessarily becomes acquainted with the broad principles of epidemiology and prophylaxis, which must be considered as

Digitized by Google

problems worthy of the medical man and the medical profession.

Whether such courses in tropical medicine can be given as well in schools outside of the tropics as in the tropics is a matter difficult to express an opinion upon. At any rate, with a hospital containing varied cases of tropical diseases, such as one finds in connection with the London School of Tropical Medicine, it is certainly possible to give outside of the tropics that training in internal medicine which links the laboratory and the bedside.

That we have in our own country schools which give equal opportunity for studying tropical diseases in the ward as well as in the laboratory is attested by the work of the School of Tropical Medicine at Tulane University, and that similar opportunity will exist at Harvard and elsewhere in the United States we have every reason to expect.

Digitized by Google

SOME FEATURES OF THE PHYSIOLOGIC ACTIVITY OF AMERICANS IN THE PHILIPPINES.*

WESTON P. CHAMBERLAIN, M. D.,
Major Medical Corps, U. S. Army, Plattsburg Barracks, N. Y.

Introduction.

The influence of the warm climate on Caucasians from the Temperate Zone who take up their residence for a longer or shorter period in the Tropics is a matter of rapidly increasing importance. In the past the effect of the climate *per se* was greatly obscured by the serious results following infections wtih various pathogenic organisms which at the present day can largely be prevented from gaining an entry into the human body by adherence to the advanced teaching of modern tropical sanitation. Consequently, exact observations as to the influence of the tropical climate on white men, if they are to be of value, must be carried out on a group of individuals who are protected as far as possible from the infections which formerly have so often led to disaster when attempts were made to colonize the Torrid Zone. Such a body of men can be found in the military forces of the United States which have served in the Philippine Islands during the last few years. These men are selected and healthy individuals when they go to the Tropics. The government spares neither effort nor expense in guarding the soldier from the dangers of infections. It is my opinion that nowhere else in the tropical world, except perhaps in Panama, can there be found a collection of men living under such a high degree of hygienic protection as is accorded to the American soldiers serving in the Philippine Islands.

The exact observations on which this paper is based were made on more than 1000 healthy soldiers stationed in the Philippines during the years 1909, 1910, and 1911. The work was instituted with a view to determining whether the complexion

*Read with permission of the Surgeon General, U. S. Army, before the Tenth Annual Meeting of the American Society of Tropical Medicine, Washington, D. C., May 6, 7, and 8, 1913.

Digitized by Google

type of white men, or whether the use of clothing obstructive to actinic rays, had any influence on the ability of the individuals to endure tropical service.[1] [21] Both questions were answered in the negative. The data collected during these observations furnished a large amount of material for a study of the action of continued high temperature on the physiologic processes of the healthy and active Caucasian.†

The individuals on whom this report is made had not all been in the Tropics for equal periods of time. At the date the men underwent their preliminary tests the average duration of Philippine service for the group was 7 months. The observations were repeated at quarterly intervals for 1 year, so that at the date of the terminal examinations these soldiers had resided, on the average, for 19 months in the Tropics.

The clothing used by these men consisted of a loose fitting khaki uniform with cotton undershirt and underdrawers. For the most part a rather narrow-brimmed khaki colored helmet was worn. The average age of the men in one section of the group was 27.7 years, and in the other section 25.3 years. The diet was essentially the same as the ration used in the United States. No special effort was made to protect the men from the sun. Contrary to the advice of English sanitary authorities, the use of cold baths, in the form of a shower, is universal among the military population of the Philippines.

Climate of Philippines.

The observations were carried out at thirteen different points in the Philippine Archipelago, ranging in latitude from 15° N. to 6° N. One station was inland and at an altitude of 600 feet. All the other stations were near sea level, and on or close to the

†This work was carried out under the supervision of the Board for the Study of Tropical Diseases as They Exist in the Philippine Islands. Most of the actual observations were made by the following officers, who were specially detailed for the purpose: Majors A. E. Truby, Roger Brooke, jr., and C. C. Collins; Captains E. G. Bingham, C. D. Cowles, jr., John R. Barber, Mahlon Ashford, E. G. Huber, H. M. Snyder, W. L. Hart, G. L. McKinney, H. A. Phillips, J. B. H. Waring, W. R. Dear, C. E. Doerr, F. S. Wright, C. G. Snow, N. L. McDiarmid, Armin Mueller, T. J. Leary, M. C. Stayer, L. C. Garcia, and C. E. Fronk, Medical Corps; and First Lieutenants W. F. de Niedman and C. A. Betts, Medical Reserve Corps. These gentlemen were all well trained in the necessary laboratory procedures, and the large number of independent observers reduces to a minimum the influence of the personal equation and of individual bias.

Digitized by Google

coast line. The range of 9° in latitude gave only slight variations in climate. In all the regions in question the climatic conditions are distinctly tropical and do not differ essentially from those found at Manila (latitude 14° N.), where the mean monthly temperature varies between 77° F. in January and 83.4° F. in May. The lowest recorded temperature in Manila is 59° F. and the highest 100° F. The relative humidity ranges from 70.7 in April to 85.5° in September, averaging 79.4° for the year. In most parts of the archipelago there is a well marked wet and dry season. In some of the most southern islands the ranges of temperature and the divisions into a wet and dry season are less marked than in Manila.‡ In the regions where the observations were made the rainfall varies from 80 to 90 inches annually. The mean monthly hours of sunshine in Manila range from 264 in April to 135 in September, averaging 184.5 for the entire year. The spectrum of the sun's rays extends into the ultra-violet little if any further in Manila than it does in the Temperate Zone, and the differences in maximum insolation are inconsiderable.[2] [19]

Observations on the Body Temperature.

There were 3040 temperature observations made at quarterly intervals during the year on 608 healthy American soldiers when at rest. Temperatures were taken by mouth in all cases, the thermometer being allowed to remain in position for 5 minutes. While the mouth temperature may not always be reliable in a cold climate it may be said that it is a very good index of the true body temperature in the Tropics, where the inspired air is both moist and warm. The hours of observations ranged from 8 a. m. to 4 p. m. The details are shown in the Table I.

Table I. Average mouth temperature in degrees F. at quarterly intervals for 608 American soldiers in Philippines.

MAY, 1910	AUG. 1910	NOV. 1910	FEB. 1911	MAY 1911	AVERAGE FOR YEAR
98.75	98.80	98.75	98.60	98.70	98.70

‡For a more detailed account of the climate see reference (1).

Digitized by Google

It will be seen that an average of 98.7° F. was obtained. Occasionally, at some quarterly observation period, certain men would show an elevation of temperature of one or more degrees without assignable cause, but such cases were not sufficiently numerous to raise the average result for the group above 98.7° F. Whether such a temperature is to be considered higher than the mean for the temperate climate must be considered. The so-called normal is usually set at 98.4°, or 98.6° F. Crombie gives the mean afternoon temperature in England as 98.34° F.[3] In order to have a standard for comparison based on the temperature of American soldiers in the cooler portions of the United States, I obtained, through the assistance of Capt. Mathew A. Reasoner, Medical Corps, U. S. Army, a number of observations made on enlisted men at Vancouver Barracks, near Portland, Oregon. On Nov. 23, on a sunny forenoon, with humidity 80 and air temperature 50° F., the average body temperature of 26 men was 98.7° F. before drill and 98.8° F. immediately after an hour of drilling. These figures do not differ from the average found in the Philippines.

It has been claimed that blond persons are more subject to increased temperatures in the tropics than are the brunette members of the Caucasian race.[3]. Tables II and III show that there is no appreciable difference between the temperatures for the two complexion types.

Table II. Comparative average temperatures in degrees F. of 111 blond and 118 brunette American soldiers in Philippines.§

Complexion Type	Feb. 1909	May 1909	Sept. 1909	Dec. 1909	Average for Year
Blond	98.8	98.8	99.1	98.7	98.9
Brunette	98.9	98.8	99.0	98.6	98.8

§The fact that the temperatures in Table II average 0.2 degree higher than in Tables I and III is due to the fact that the men in Table II were examined shortly after drilling. This matter will be discussed further on under the heading of "Influence of Exercise."

Digitized by Google

Table III. Comparative average temperatures in degrees F. of 307 blond and 301 brunette American soldiers in the Philippines.

Complexion Type	May 1910	Aug. 1910	Nov. 1910	Feb. 1911	May 1911	Average for Year
Blond	98.8	98.8	98.7	98.6	98.7	98.7
Brunette	98.7	98.8	98.8	98.6	98.7	98.7

From the above it may be concluded that *the temperature of American soldiers doing duty in the Philippines shows no appreciable variation for season or for complexion type, that it averages 98.7° F., and that this average differs little if at all from the mean normal temperature for white men living in the United States.* This is in accord with the experience of Plehn, and of Castellani and Chalmers, as regards the temperature of acclimated Europeans in the Tropics.[3]

Observations on the Pulse and Respiration Rates.

These observations were carried out on 608 soldiers and the results appear in Table IV. It will be observed that season had no appreciable effect on either pulse or respiration rates, nor was there any material difference between the figures at the beginning and at the end of the year of tropical residence. The complexion type exercised no influence on the rapidity of pulse or respiration. The average rate of 77.3 heart beats per minute is a little above the standard of 72 or 75 which has been established for temperate climates. The respiration rate of 19.3 is quite noticeably rapid if one accepts the standard as 14 to 18 for cool countries. This increase in respiratory activity is probably, in part, due to a heated, and consequently rarified atmosphere, and, in a measure, to an effort to eliminate bodily heat by more rapid pulmonic action.

Table IV. Average pulse and respiration rates at quarterly intervals for 608 American soldiers in Philippines.

	May 1910	Aug. 1910	Nov. 1910	Feb. 1911	May 1911	Average for Year
Pulse.....	77.8	77.2	77.6	77.2	77.1	77.3
Respiration...	19.4	19.3	19.1	19.3	19.2	19.3

Digitized by Google

Estimation of the Blood-Pressure.

Five thousand three hundred and sixty-eight systolic blood-pressure estimations were made on 992 American soldiers in the Philippines. Dr. Cook's modification of the Riva-Rocci apparatus was used and the readings were reduced to the basis of a 5 inch (12.5 cm.) armlet. The observations were taken with the cuff on the upper arm and the individual sitting up. The results, arranged according to age, are given in Table V. Tables VI and VII show the findings for two large groups of men in which the pressure readings were made at quarterly intervals with a view to determining the influence of season.

Table V. Average systolic blood-pressures based on 5368 observations which were made on 992 American soldiers serving in the Philippines; arranged according to age. (5 inch armlet.)

Age Period in Years	Average Age in Years	Number of Men Showing Pressures From							Total Number of Men	Average Pressure
		91 to 100 mm.	101 to 110 mm.	111 to 120 mm.	121 to 130 mm.	131 to 140 mm.	141 to 150 mm.	151 to 160 mm.		
18—20	19.4	1	12	13	8	1	1	—	36	115.0
20—25	22.8	32	156	165	87	22	5	2	469	114.3
25—30	27.2	16	73	108	70	13	3	3	286	115.9
30—35	32.6	2	34	42	23	7	1	—	109	116.7
35—40	37.5	—	9	24	14	8	3	—	58	120.5
Over 40	43.1	2	3	17	7	2	2	1	34	119.6
Totals or Averages	26.6	53	287	369	209	53	15	6	992	115.6

Table VI. Average systolic blood-pressure at quarterly intervals for 404 American soldiers in Philippines. (5 inch armlet.)

Average Age in Years	May 1910	Aug. 1910	Nov. 1910	Feb. 1911	May 1911	Average for Year
27.7	117.1	117.8	117.8	117.5	117.7	117.6

Digitized by Google

Table VII. Average systolic blood-pressure for 229 American soldiers in Philippines. (5 inch armlet.)

Average Age in Years	MARCH 1909	MAY 1909	SEPT. 1909	DEC. 1909	Average for Year
25.3	117.2	113.9	114.5	117.5	115.8

The mean pressure for the 5368 readings on 992 men was 115.6 millimeters of mercury. The average age of the group was 26.6 years. Comparisons of the sub-groups in Table V and the groups in Tables VI and VII show that for men of 25 years of age a mean pressure between 115 and 118 millimeters may be looked for. No seasonal variation was evident in Table VI and only a slight one in Table VII, where the pressure averaged 3 millimeters lower in May, the hottest month of the year. *The average pressure of* 115 *to* 118 *millimeters found in these large bodies of men differs little if any from the accepted standard among males of the same age in the Temperate Zone when the* 5 *inch armlet is used.* Janeway places the normal pressure for young adult males between 100 and 130 millimeters in America, and Gallavardin between 110 and 120 in France. Bachmann, in Philadelphia, found an average of 119 millimeters for 53 men ranging in age from 21 to 30 years.[4] [5] [6] [7] It is interesting to note that the pressure for Americans was not different from the average for Filipinos. In a group of 345 Filipino males, averaging 25 years of age, the mean pressure was 115.5 millimeters.

Length of tropical residence did not seem to have any constant influence on the blood-pressure as is shown by Table VIII, nor was the pressure affected by the complexion type.[4] [1]

Table VIII. Average systolic blood-pressure of 991 American soldiers in Philippines, arranged according to length of tropical residence.

Length of Tropical Residence	Number of Men	Average Pressure	Average Age in Years
3 months or less	234	114	23.2
3 to 6 months	88	120	26.9
6 to 9 months	211	114	25.7
9 to 12 months	291	117	25.7
Over 12 months	167	120	29.9

Digitized by Google

Influence of Philippine Residence on the Body Weight.

Three thousand and forty-eight observations, made on 608 men at three month intervals, are shown in Table IX. It will be remembered that the soldiers had resided in the Philippines for an average period of 7 months at the time they were first examined. At the end of a year of observation, when their average tropical service was 19 months, there had been a mean loss of 2 pounds, or 1.3 per cent of the original weight. This loss was progressive from quarter to quarter and was not in any way influenced by complexion type. In order to determine if the large men lost flesh in any greater degree than the small ones, the weight readings at the beginning and at the end of a year for a group of 1243 men were arranged into sub-groups according to the height of the men. The details appear in Table X. With increasing height there was a progressive rise in weight. Therefore, each sub-group consisted of men who were larger than those in the preceding sub-group. There was no material difference in the length of tropical service for the different sub-groups. On examining the column showing percentage of losses it is obvious that there was no progressive change either upwards or downwards. *In other words, the percentage of weight lost during the observation year was not affected by the size of the man.* This is a point of some interest in view of the oft repeated statement that small men are better suited than large ones for tropical service.[8] [9]

Table IX. Average weight of 608 American soldiers in Philippines, arranged by quarterly periods.

Average Height in Inches	Average Weight in Pounds					Loss During Year	
	May 1910	Aug. 1910	Nov. 1910	Feb. 1911	May 1911	Pounds	Per Cent
67.5	148.3	147.8	147.5	147.3	146.3	2.0	1.34

Digitized by Google

Table X. Average weights of 1243 American soldiers in Philippines, arranged according to size of men. One year between initial and terminal observations.

Height in Inches	No. of Men	Average Weight in Lbs.		Average Loss of Weight		Average Tropical Service at Terminal Observation
		At Initial Observation	At Terminal Observation	Pounds	Per Cent	
Under 64...	27	132.9	131.2	1.7	1.28	19.4 months
64...	114	134.7	132.7	2.0	1.48	23.1 "
65...	157	139.9	137.5	2.4	1.72	21.9 "
66...	187	141.9	140.5	1.4	0.99	23.2 "
67...	225	144.4	142.3	2.1	1.45	22.8 "
68...	251	147.2	146.0	1.2	0.81	23.8 "
69...	127	152.7	150.0	2.7	1.77	22.1 "
70...	80	155.6	154.7	0.9	0.57	22.0 "
71...	40	159.0	158.0	1.0	0.63	21.2 "
72 or over...	35	164.5	161.3	3.2	1.94	23.6 "

The Influence of the Philippine Climate Upon the Blood.

A large amount of time was devoted to a study of the red cells, the haemoglobin and the leucocytes, details of which are shown in Tables XI, XII, XIII and XIV. It was found, as a result of 1418 erythrocyte counts on 702 healthy soldiers, that the average number of corpuscles was 5,200,000 per cubic millimeter after more than 19 months residence in the Philippine Islands. A like number of haemoglobin estimations on the same men gave an average reading of 89.6%. The color index, therefore, was between 86 and 87.[10] These findings agree closely with those of Wickline, who studied the subject in 1908.[11] *Such observations go to show that among the healthy soldiers serving in the Philippines there is no definite anaemia.* A haemoglobin reading of 89.6 cannot be considered appreciably below normal.[12] [13] [14] I believe that the so-called "tropical anaemia," often referred to in the past, is due, not to the action of the climate *per se,* but to the pernicious influence of uncinaria, plasmodia, Leishmania, and perhaps other parasites. There is undoubtedly a certain degree of pallor which is often seen in apparently healthy residents of the tropics, and which is accompanied by no diminution of red cells or haemoglobin.[15] [16] This condition disappears almost immediate-

Digitized by Google

ly on entering a cool region and, in my opinion, is due to cutaneous ischaemia and not to impoverishment of the blood.[17]

Table XI. Average erythrocyte counts and haemoglobin estimations on 601 American soldiers who at date of initial examination had served on the average 6.6 months in the Philippines.

Date of Examination	Average No. of Erythrocytes Per Cubic Millimeter	Average Haemoglobin	Average Color Index
M..y ..nd June, 1910.....	5,111,000	90.3	0.88
May and June, 1911.....	5,226,000	89.6	0.86

Table XII. Range of erythrocyte counts for 687 healthy American soldiers who at date of count had served on the average twenty months in the Philippines.

Range of Erythrocyte Count Per Cubic Millimeter	Number of Men	Per Cent of Total Number	Range of Erythrocyte Count Per Cubic Millimeter	Number of Men	Per Cent of Total Number
Under 4,000,000	15	2.2	5,500,000—5,749,000	76	11.1
4,000,000—4,249,000	26	3.8	5,750,000—5,999,000	39	5.6
4,250,000—4,499,000	37	5.4	6,000,000—6,224,000	35	5.1
4,500,000—4,749,000	60	8.8	6,225,000—6,499,000	24	3.5
4,750,000—4,999,000	112	16.3	6,500,000—6,749,000	12	1.7
5,000,000—5,224,000	155	22.5	6,750,000—6,999,000	14	2.1
5,225,000—5,499,000	77	11 2	Over 7,000,000.....	5	0.7

Table XIII. Range of haemoglobin readings for 702 healthy American soldiers who at date of examination had served on the average twenty months in the Philippines.

Range of Haemoglobin	Number of Men	Per Cent of Total Number	Range of Haemoglobin	Number of Men	Per Cent of Total Number
Under 80 per cent ..	8	1.1	90 to 94 per cent....	261	37.2
80 to 84 per cent....	64	9.2	95 to 99 per cent....	136	19.4
85 to 89 per cent....	185	26.4	100 per cent or over.	48	6.7

Enumerations of the white cells, differential counts, and nuclear estimations according to the method of Arneth were made on 72 soldiers, and the results appear in Table XIV. The average number of leucocytes per cubic millimeter was 7304, a result which does not differ from the standard for temperate re-

Digitized by Google

gions. In the differential count there was a decided increase in lymphocytes and a decrease in the polymorphonuclear elements, the small lymphocytes averaging 31.7%, the large lymphocytes 6.9%, and the polymorphonuclears only 56.8%. In the Arneth picture there was a very slight shift to the left. It is of interest to note that among Filipinos the reduction in polymorphonuclear cells was more marked than in the white men, and there was a very decided shift to the left in the Arneth classification. Wickline and Phalen found a similar diminution in the polynuclear cells of American soldiers.[11] [21] Whether these changes in the leucocyte counts and in the Arneth pictures are due to climate, and whether they are of any significance, are subjects which still remain to be worked out. Space will not allow discussion of the possible bearing of these findings on resistance to infection, a matter which has been taken up in another paper.[18]

Table XIV. Average differential and Arneth counts on 72 American soldiers who had served more than 18 months in the Philippines.

White Cells per Cubic Millimeter	Polynuclears	Eosinophiles	Lymphocytes, Small	Lymphocytes, Large	Mast Cells	Arneth's Classification Per Cent					Arneth's Index
						I	II	III	IV	V	
7,304	56.8	3.8	31.7	6.9	0.8	13.3	32.9	37.2	14.6	2.0	46.2

The Urine in the Tropics.

The urine of 576 men was examined at the beginning and at the end of the observation period of one year. Albumen was found in 5 and casts in 10 of the men at the initial observation. At the terminal examinations 6 had albumen and 13 casts. The average specific gravity was 1019.9 at the beginning and 1019.7 at the end of the year. An examination of the specific gravity of a single specimen of urine is of course in itself of little value, but when the specific gravity of single specimens from several hundred men are averaged and found to be normal, the results have considerable importance in the direction of show-

Digitized by Google

ing that the group of men is normal as regards renal elimination. This is of interest in view of the fact that it is claimed by some writers that there is a tropical renal insufficiency, and by others that the urine in the tropics causes irritation by reason of too great concentration. In my series the average concentration was normal. Unfortunately it was impracticable to estimate the total twenty-four hour amount of urine and the total solids.

Table XV. Examinations of urine of 576 American soldiers serving in the Philippines.

Date	Number Showing Albumin	Number Showing Casts	Average Specific Gravity
May, 1910	5	10	1019.9
May, 1911	6	13	1019.7

Influence of Exercise on Americans in the Philippines.

The effect of moderate exercise on the healthy men under consideration was exactly what would be expected as a result of exertion in warm weather, viz., an acceleration of the pulse and respiration, a very slight increase in temperature, and a considerable rise of blood-pressure. A slight increase of temperature due to this cause is shown in Table II. The other features are illustrated in Tables XVI and XVII.

Table XVI. Average pulse and respiration rates of 229 American soldiers in Philippines, taken soon after drilling.

	Feb., 1909	May, 1909	Sept., 1909	Dec., 1909	Average for Year
Pulse	84.1	92.1	91.4	85.1	88.2
Respiration...	20.1	20.8	20.3	19.2	20.2

Table XVII. Average pulse, respiration, temperature and blood-pressure observations on 473 American soldiers in Philippines, taken immediately after exercise.

Date	Pulse	Respiration	Temperature	Blood-Pressure
May, 1910.....	86.7	21.5	98.96	126.3
May, 1911.....	83.3	20.9	98.78	124.7

Digitized by Google

As regards the systemic effect of exercise I believe that it is just as beneficial in the tropics as elsewhere. The men who take plenty of exercise out of doors, in the sun, are the ones who remain in health in the Islands. The great amount of sickness, especially disturbances of the nervous system, occurs among the women who rarely go out in the daytime. Exercise in the sun need not be feared, since sunstroke is practically unknown and heat exhaustion very unusual in the Philippines.

The Effects of the Philippine Climate on the Nervous System.

The influence of the Philippine climate on the nervous systems of Americans in the military service is a subject upon which it is extremely difficult to obtain exact observations or thoroughly reliable information. The latter difficulty is increased by the prejudice against Philippine service which originated as a result of the discomforts of the early years of our occupation, and which has been fostered by some medical men who take an unduly pessimistic view of the effects of tropical residence. That mental and nervous diseases should have been very prevalent in the early years of campaigning was to be expected because of nostalgia and tedium, with resulting alcoholic and venereal excesses; because of the scarcity of white women; because of the separation of families; because of the hardships and bad food; and especially because poor sanitation led to great numbers of serious infections with plasmodia, amoebae, uncinaria, cutaneous fungi, and other harmful parasites.[22] *Under the improved conditions which have prevailed during the last nine years the admissions to sick report for mental and nervous diseases, and the deaths from suicide, in the Philippine Islands have not differed materially from the rates for the same factors among troops stationed within the continental limits of the United States.* In a number of years the rates have been higher in the United States. The figures, compiled from the reports of the Surgeon General of the Army, appear in Tables XVIII and XIX.

Digitized by Google

Table XVIII. Relative admissions for insanity and for nervous diseases among American troops serving in the Philippine Islands and in the United States.

Calendar Year	Admission Rate Per 1000			
	Insanity		Nervous Diseases	
	P. I.	U. S.	P. I.	U. S.
‖1903	1.05	1.02	22.67	21.77
1904	1.75	1.71	20.34	22.10
1905	1.45	1.61	20.53	19.49
1906	2.02	1.33	19.55	19.47
1907	1.88	1.79	19.32	20.15
1908	1.09	1.58	19.30	18.44
1909	1.56	1.63	16.82	16.61
1910	1.87	1.58	16.53	13.97
1911	2.01	1.68	19.75	13.09
¶Average for 9 years..	1.58	1.55	19.57	18.00

Table XIX. Relative rates per thousand for suicide among American troops serving in the Philippines and in the United States.

	1903	1904	1905	1906	1907	1908	1909	1910	1911	Average for 9 Years
P. I..	.62	.41	.36	.81	.59	.66	.31	.32	.72	.56
U. S..	.44	.50	.65	.66	.51	.52	.49	.48	.59	.54

To account for the slight excess of nervous and mental diseases, and of suicide, which occurred during certain years in the Philippines, it is not necessary to invoke the aid of climatic influences, since all of the unfavorable conditions mentioned above still exist, though to a very much smaller extent than they did in the early days of our occupation.

In the course of the investigations into the influence of climate certain questions were asked of 640 soldiers who had been under observation for a year, and also of a body of 568 military officers and policemen who, on the average, had resided for 5.5 years in the Philippines. Seventeen per cent of

‖Figures for Philippines in 1903 include troops serving in China.
¶Averages in Tables XVIII and XIX were obtained by dividing total admissions for 9 years by sum of mean strengths for same year.

Digitized by Google

the men reported some loss of memory in the tropics. Insomnia was complained of by 6 per cent, irritability by 25 per cent, and depression by 13 per cent. From observation and personal experience I believe that continued residence in the tropics tends to reduce the nervous energy and the desire for work, but I think these are promptly regained on return to a cold climate. This relaxing effect is probably due to the evenness of the climate, rather than to a high degree of insolation.[19]

The Action of the Digestive System in the Philippines.

The opinion, based on theoretical grounds, that the diet for the tropics should be materially different from that in the Temperate Zone, is not supported by practical experience. I believe that the appetite is the best guide to the quantity and kind of food to be consumed in the Philippines. Among the 1208 men referred to in the last paragraph only 6.4 per cent stated that they had lost appetite. Three per cent claimed to eat more and 10 per cent to eat less food than at home, while the remaining 87 per cent considered their dietary habits the same as in the United States.

Just how much reliance should be placed on the statements regarding subjective sensations noted under the last two subheads is uncertain. All of the men were doing full duty when the questions were asked. Probably many of the answers were somewhat fanciful, and were influenced more or less by the individual's like or dislike for Philippine service. Of the entire 1208 men 23% did not enjoy tropical service and 77% did. Twenty per cent did not feel as well as in the United States, 7% felt better, and 73% noticed no change.

Bearing of These Observations on the Colonization of the Philippines.

When one reviews the observations just submitted it is impossible to find any evidence which clearly indicates that the climate has done harm to men who have spent 19 months in the Philippines. Neither did the group of men which had av-

Digitized by Google

eraged 5.5 years in the Tropics appear to have suffered. Much that has been written in regard to the baneful influence of the Torrid Zone has failed to separate the pure effects of climate from the effects of infections and other factors which are especially prevalent in hot countries. Many authors have attributed a considerable part of the morbidity of the Tropics to the action of light, especially the shorter waves of the solar spectrum, and some have claimed that the effects were most pronounced on those Caucasians having fair complexions. My own work failed to show that brunettes possessed any advantage over blonds.[1] There is much room for doubt as to whether light, or actinic rays, are factors in tropical morbidity and mortality. The solar spectrum extends little if any further into the ultraviolet in Manila than it does in the United States.[2] The injurious effects which are sometimes attributed to an excessive amount of light can be produced by heat and humidity in the absence of light. The experiments of Aron in Manila are of special interest in this connection. He found that monkeys exposed to the direct rays of the sun would die in about an hour from hyperpyrexia, while others, exposed in the same manner, but cooled by the blast of an electric fan, remained perperfectly well.[2] It is my belief that such influence as the Philippine climate exerts on the white man is the result of continued heat and humidity.

To resist the heat the Caucasian is in part better adapted than the brown or black man, because his white skin absorbs less readily and the subcutaneous temperature remains lower on exposure, as has been shown by Gibbs.[22] On the other hand, it has been found by Clark that the white man has a smaller number of sweat glands than does the Malay or the Negro. Also the dark-hued skin radiates heat more freely than the light. In these two respects the Caucasian is at a disadvantage, especially when high relative humidity renders exaporation less complete. With very little trouble the white man can protect himself almost entirely by suitable clothing from the effects of heat and humidity.[19] This clothing should be light in color, and a single layer of it is ample to protect from the ultraviolet rays, if any such protection is needed.[19] It is like-

Digitized by Google

ly that the negro was originally a forest dweller, and that his dark skin developed as a protection against animate enemies rather than as a protective effort against excessive insolation.[19] It seems probable that many of the acute untoward effects attributed to the sun are due to the rapid loss of fluids from the system, and could be preevnted if a larger amount of water were ingested.

The late Dr. Freer, who for years had studied the subject of tropical sunlight, arrived at the conclusion that the climate of the Philippines is by no means deleterious to the Caucasian if he takes ordinary precautions. Castellani and Chalmers express a similar opinion in regard to the tropics in general. The experience of our troops in Cuba, and the Philippines, and of our white employees in Panama,[24] gives a practical demonstration of how the tropical countries can be robbed of most of their terrors by attention to sanitation.

It is still an unsettled question whether, under improved sanitary conditions, it will be possible for the white race to colonize permanently in the tropics and to reproduce its kind generation after generation. Such a colonization appears to have succeeded in Hawaii (latitude 18° N.) where, fortunately, many of the most dangerous tropical diseases were not originally endemic. In Barbados (latitude 13° N.), which is nearer to the equator than Manila, Nicholls states that the English have lived and reproduced for nearly 300 years. There are many men and women of pure English stock living there who have never been to a temperate climate, yet they are physically and mentally as well equipped as Europeans. Most of these people are managers and overseers on estates. Nicholls attributes the difference between the white inhabitants of Barbados and those of the other West Indian Islands to the fact that in Barbados malaria is absent, intestinal parasites are fewer, and the struggle for existence is keen.[20] He concludes that malaria, intestinal parasites, venereal diseases and alcohol are practically the sole cause of failure, death and degeneracy in the tropics. Such examples as Barbados and Hawaii, joined with the successes in the Philippines, Cuba, Panama and elsewhere, raise the hope that the complete con-

Digitized by Google

quest of certain parts of the tropics by the white race is not beyond the possibility of realization.

Conclusions.

1. Healthy American males, averaging about 25 years of age, after 19 months residence in the Philippines, show:

(a) An average body temperature by mouth of 98.7° F.
(b) An average pulse rate of 77.3 beats per minute.
(c) An average respiration rate of 19.3 per minute.
(d) An average systolic blood-pressure of 115.6 millimeters.
(e) An average loss of weight during one year of 2 pounds, or 1.3%.
(f) No greater percent of loss for large men than for small men.
(g) An average erythrocyte count of 5,200,000 per cubic millimeter.
(h) An average haemoglobin reading of 89.6%.
(i) An average leucocyte count of 7304 per cubic millimeter.
(j) An average polymorphonuclear count of 56.8%, with small lymphocytes 31.7% and large lymphocytes 6.9%.
(k) A very slight shift to the left in the Arneth picture.
(l) An average specific gravity of urine of 1019.8.
(m) No appreciable effect on items (a) to (i) as a result of complexion type or season.
(n) A very slight increase in temperature and respiration rate, a moderate increase in pulse rate, and a considerable elevation of blood-pressure as a result of moderate exercise.

2. There is no material difference in the admission rates for insanity and nervous diseases, and in the ratio of suicides, for troops serving in the Philippines and for those stationed in the United States.

3. Among 1208 men residing in the Philippines:

(a) Seventeen per cent complain of some loss of memory.
(b) Six per cent complain of insomnia.

Digitized by Google

(c) Twenty-five per cent complain of depression.
(d) Six per cent complain of irritability.
(e) Six per cent complain of anorexia.
(f) Eighty-seven per cent eat as much as at home, 3% more and 10% less.

Since all the men were doing full duty, it is probable that the sensations complained of were of slight degree and perhaps in many cases fanciful.

4. It seems probable that climate, *per se*, exercises little if any harmful influence on Americans in the Philippines.

5. By far the larger part of the morbidity and mortality in the Philippines is due to nostalgia, isolation, tedium, venereal disease, alcoholic excess, and especially to infections with various parasites.

6. The facts justify the hope that the progress of tropical sanitation may ultimately permit the permanent colonization of certain parts of the tropics.

References.

(1) Chamberlain, W. P. Observations on the Influence of the Philippine Climate on White Men of the Blond and Brunette Type. Phil. Jour. Sci. Sec. B. 1911, vi, p. 427.

(2) Aron, H. Investigations on the Action of the Tropical Sun on Men and Animals. Phil. Jour. Sci. Sec. B. 1911, vi, p. 101.

(3) Castellani, Aldo, and Chalmers, A. J. Manual of Tropical Medicine, New York, 1910, p. 53.

(4) Chamberlain, W. P. A Study of the Systolic Blood-Pressure and Pulse Rate of Healthy Adult Males in the Philippines. Phil. Jour. Sci. Sec. B. 1911, vi, p. 467.

(5) Janeway, P. C. Clinical Study of Blood-Pressure. New York, 1907.

(6) Gallavardin, L. La Tension arterielle en clinique. Paris, 1910, p. 41.

(7) Bachmann, G. Measurement of Arterial Pressure in Man. New York Med. Jour. 1911, xciii, p. 212.

(8) Woodruff, C. E. Effects of Tropical Light on White Men, New York, 1905, p. 343.

(9) Munson, E. L. Military Hygiene. New York, 1901, p. 863.

(10) Chamberlain, W. P. The Red Corpuscles and the Haemoglobin of Healthy Adult American Males Residing in the Philippines. Phil. Jour. Sci. Sec. B. 1911, vi, p. 483.

(12) Faught, F. A. Laboratory Diagnosis. Philadelphia, 1910, p. 36. Mil. Surg. 1908, xxiii, p. 283.

(12) Faught, F. A. Laboratory Diagnosis, Philadelphia, 1910, p. 36.

(13) Buchanan, J. M. Blood in Health and Disease. London, 1910, p. 11.

(14) Chamberlain, W. P. Prevalence and Importance of Uncinariasis Among Apparently Healthy Southern-bred Recruits. Arch. Int. Med., 1909, iv, p. 8.

(15) Scheube, B. Diseases of Warm Countries. Philadelphia, Tnd Ed., p. 150.

Digitized by Google

(16) Castellani, A., and Chalmers, A. J. Manual Tropical Medicine. New York, 1910, p. 69.

(17) Musgrave, W. E., and Sison, A. G. Blood Pressure in the Tropics. Phil. Jour. Sci. Sec. B., 1910, v, p. 325.

(18) Chamberlain, W. P., and Vedder, E. B. A Study of Arneth's Nuclear Classification of the Neutrophiles in Healthy Adult Males. Phil. Jour. Sci. Sec. B., 1911, v, p. 405.

(19) Freer, P. G. Tropical Sunlight, Trans. 2nd Congress Far Eastern Assoc. Trop. Med., Hong-Kong, 1912, p. 186. Also Phil. Jour. Sci. Sec. B., 1912, i, p. 1.

(20) Nicholls, L. Correspondence. Jour. Trop. Med. and Hyg., 1913, xvi, pp. 1-15.

(21) Phalen, J. M. An Experiment with Orange-red Underwear. Phil. Jour. Sci. Sec. B., 1910, v, p. 525.

(22) Gibbs, H. D. Study of Effects of Tropical Sunlight upon Men, Monkeys and Rabbits and Discussion of Proper Clothing for Tropical Climate. Phil. Jour. Sci. Sec. B., 1912, ii, p. 91.

(23) Ogilvie, W. H. Sunstroke, a Heresy. Jour. R. A. Med. Corps, 1912, xix, p. 444.

(24) Gorgas, W. C. Sanitation on Canal Zone. Jour. Amer. Med. Assoc., 1913, lx, p. 953.

(25) Cormack, J. G. Climate and Other Factors in Relation to Health of Europeans in China. Jour. Trop. Med. and Hyg., 1913, v, p. 66.

Discussion.

Dr. Malcolm Watson, Klang, Federated Malay States: As a result of thirteen years' residence in the Federated Malay States, it is my opinion that if certain infectious diseases can be excluded the white men keep in excellent health. The real difficulty lies in avoiding infectious disease. There is more difficulty with children than with adults. Children cannot be kept away from the natives and the standards of native thought is so different from our standards that it is almost impossible to bring children up in the tropics. The association with the natives, in addition to its moral aspect, gives greater likelihood for the contraction of infection.

Dr. Charles F. Craig, Washington: In the Canal Zone it is a rule that every white man shall take a vacation once a year and go north. It has been found that the men lose energy after they have stayed for a long time in the Zone.

Dr. Creighton Wellman, New Orleans: The question of staleness, nostalgia, moral and social problems will be at a minimum when the facilities for amusement now to be found in temperate climates are accessible in the tropics. Granting the control of infectious disease, the world is open to colonization by the white man.

Dr. Elmer F. Otis, Peñuelas, Porto Rico: It appears to us that there are certain special infectious diseases that are more fatal to the white man in Porto Rico than to the native. Sprue is one of these infections.

Dr. Henry J. Nichols, Washington: In any discussion of this question, the white woman and the white child must be considered. I accept the data that Dr. Chamberlain gives for troops, but I would not be willing to see the conclusions transferred to women and children. In the Philippine Islands the women are actually damaged by the climate. I have seen women who were interested in the life, who had no infectious disease, and who wanted to stay, but who were unable to do so on account of the influence of climatic conditions upon them. Many of them had menstrual disturbances. As woman is the foundation of the home, I can entertain no great hope of colonization of the tropics by the white race.

Dr. Henry R. Carter, Baltimore: The white man who does not drink, who gets no infectious disease, and who takes sufficient exercise, will do well in the tropics. Babies as a rule do better in Panama than in the United States; but from the age of 3 or 4 years to 14 or 15 years children do not get enough exercise. They become too fat, have a pasty complexion, and do badly. It is a question in my mind whether under ordinary living conditions white people will keep well in the tropics. The women become lazy and the children fat and pasty.

Digitized by Google

Dr. C. S. Ludlow, Washington: American women in the Philippine Islands commonly lose interest in the things that they are interested in at home. They do not take sufficient exercise to keep them well.

Dr. Chamberlain: It is true that among American women in the Philippine Islands initiative is often lacking. Those who get out, however, and take sufficient exercise, in my opinion do fairly well. The English women do better than the American women, because they care more for out-of-door life. The children enjoy their play and do well. Association with the natives is a bad feature; but it is not so bad in the Philippine Islands as it is in Mohammedan countries. Nostalgia is a very important disease in the Philippine Islands. I believe the Philippine Islands can be colonized by the white race if the individuals are well when they go out, and if they take proper care of themselves after reaching their stations.

Digitized by Google

THE SPECIES OF ANOPHELES THAT TRANSMIT HUMAN MALARIA.*

FREDERICK KNAB,
Bureau of Entomology, U. S. Department of Agriculture.

The purpose of this paper is not so much to present new facts or ideas with regard to the relation of *Anopheles* to malaria, but rather to stimulate investigators to activity in this rather neglected field of malaria research. As yet our knowledge of the habits of *Anopheles,* their relation to the human species and the part played by the separate species in malaria transmission, is very inexact and fragmentary. Treatises and manuals abound with general statements, often sweeping in character, grossly misleading and based upon insufficient observation and scant acquaintance with the literature. One is led to gather from these statements that all *Anopheles* are practically alike in habits and that observations on the habits of one species are applicable to any other. In fact, there is great individuality in the habits of the different species, both as adults and during their developmental stages. It is the belief of the writer that accurate and comprehensive knowledge of the habits of the different species of *Anopheles* will greatly advance the study of malaria; in fact, we can look to this side for the solution of certain questions that are still unsolved.

Notable work along the lines just indicated, to which I shall again refer, has been done in India by James and Liston, and this work has thrown much light on the malaria problems of that country.[1] Many others have done excellent work in different parts of the world. Indeed, a considerable mass of facts regarding *Anopheles* has been brought to light, but these have never been coördinated or made accessible to the general student.

The brilliant results of Grassi, based as they were upon biological considerations and studies, greatly stimulated the biological investigation of mosquitoes in the years that immediately followed. It may be said that a pronounced check, and one

*Read at the Tenth Annual Meeting of the American Society of Tropical Medicine, held in Washington, D. C., May 6, 7, and 8, 1913.

Digitized by Google

that has lasted to this day, was given to the biological investigation of mosquitoes by the voluminous and unsatisfactory systematic work which followed. Indeed, it may almost be said that the biological work declined in proportion with the increase of systematic activity.

To be sure, the interest in the subject led to the discovery of many previously unknown forms, and, in the interest of accuracy, these had to be described. But the subject was made needlessly difficult by hasty work and by the sub-division of the old genus *Anopheles* into numerous ill-defined and fancifully differentiated genera. The intricacies of this "system," unwarranted from both a scientific and practical standpoint, even the trained entomologist could not tread with safety, and to others it could be no less than hopeless or disastrous. This subject has been so frequently and fully discussed that it is only unavoidably touched upon here. Its effects may best be illustrated by quoting the various combinations of generic and specific names that have been used to designate the most important and most easily recognized species of our tropical American *Anopheles*.

Anopheles albimanus Wiedemann,
Anopheles cubensis Agramonte,
Anopheles argyrotarsis variety *albipes* Theobald,
Cellia albipes Giles,
Nyssorhynchus cubensis Blanchard,
Anopheles dubius Blanchard,
Cellia argyrotarsis albipes Goeldi,
Cellia albimana Theobald,
Anopheles albipes Howard,
Nyssorhynchus albimanus Surcouf and Gonzalez-Rincones.

Thus it will be seen that for one of the commonest and most obvious species no less than ten different combinations have been used.

The accurate determination of the species of *Anopheles* becomes an important matter because the mere determination of the presence of *Anopheles* does not solve a malaria problem. Only a fraction of the species are efficient malaria transmitters, and the broad statement that "*Anopheles*" transmits malaria

Digitized by Google

is an unwarranted generalization. With the diversity of habits that exists in the different species it is essential that the species present in a locality and their relation to malaria should be accurately determined. Thus of thirty-four species now known to occur in the Western Hemisphere, only eight, or 23.5 per cent, have been definitely proved malaria transmitters.

A good example of the effect of inaccuracy in the specific determination of *Anopheles* is furnished by the literature on a severe type of malaria occurring along the littorals of the East Indies. DeVogel, discussing the prevalence of this malaria along the Javan coast, attributed it to the presence of a certain species of *Anopheles* which he found breeding in pools of highly saline water and which he stated to be *Anopheles rossii.*[2] Now *Anopheles rossii* is one of the commonest species in the Orient and has been carefully studied in regard to the malarial relation. Investigations had always shown that this species is not an efficient host of the malarial parasites and, therefore, that it is incapable of transmitting malaria. In consequence de Vogel's results were discredited. More recently malarial conditions very similar to those described by de Vogel have been found to exist in the Andaman Islands and it was there determined that the species breeding in the salt pools (undoubtedly identical with that observed by de Vogel), and which proved to be the malaria transmitter, is a species closely resembling but distinct from *Anopheles rossii.*[3]

It was originally my purpose to deal with the malaria transmitting *Anopheles* for the whole world, but lack of time compels me to restrict myself mainly to the American forms and refer to Old World species only when observations on them best illustrate some interesting point. For better orientation I will give a list of the American *Anopheles,* including under this generic name all the species of the so-called Anophelina of recent authors. The specific names may be divided into four categories as follows:

I. Valid Species with Their Correct Names.

albimanus Wiedemann,
albitarsis Arribálzaga,
apicimacula Dyar & Knab,
mediopunctatum Theobald,
neivai Howard, Dyar & Knab,
nigritarsis Chagas,

Digitized by Google

argyritarsis Robineau-Desvoidy, *nimba* Theobald,
atropos Dyar & Knab,
barberi Coquillett,
bellator Dyar & Knab,
boliviensis Theobald,
braziliensis Chagas,
eiseni Coquillett,
eiseni Coquillett,
fajardi Bourroul,
gilesi Peryassú,
grabhamii Theobald,
intermedium Peryassú,
maculipes Theobald,
malefactor Dyar & Knab,
nivae Cruz,
occidentalis Dyar & Knab,
parva Chagas,
peryassui Dyar & Knab,
pseudomaculipes Peryassú,
pseudopunctipennis Theobald,
punctimacula Dyar & Knab,
punctipennis Say,
quadrimaculatus Say,
strigimacula Dyar & Knab,
tarsimaculata Goeldi,
vestitipennis Dyar & Knab,
walkeri Theobald.

II. Synonyms.

albipes Theobald=*albimanus* Wiedemann,
annulimanus Van der Wulp=*quadrimaculatus* Say,
argentinus Bréthes=*pseudopunctipennis* Theobald,
bigotii Theobald=*albitarsis* Arribálzaga,
cruzii Dyar & Knab=*boliviensis* Theobald,
cubensis Agramonte=*albimanus* Wiedemann,
franciscanus McCracken=*pseudopunctipennis* Theobald,
gorgasi Dyar & Knab*=*tarsimaculata* Goeldi,
hiemalis Fitch=*punctipennis* Say,
lutzii Cruz(*Anopheles*)=*albitarsis* Arribálzaga,
lutzii Theobald=*boliviensis* Theobald,
lutzi Cruz (*Manguinhosia*)=*peryassui* Dyar & Knab,
maculipennis authors (American specimens only)=*quadrimaculatus* Say,
nigra Theobald=*albitarsis* Arribálgaza,
perplexens Ludlow=*punctipennis* Say,
tibiamaculata Neiva=*eiseni* Coquillett.
tucumanus Lahille=*punctipennis* Theobald,†

Anopheles gorgasi was described from a single specimen in rather poor condition. It differs from *Anopheles tarsimaculata* only in the markings of the hind tarsi. The fact that among the numerous specimens of *Anopheles* since received from the Panama region no like specimens have turned up, leads us to conclude that the specimen described as *gorgasi* is an abnormality.

† On information from Dr. Arthur Neiva of Rio de Janeiro.

Digitized by Google

III. Unrecognized Species.

annulipalpis Arribálzaga.
punctipennis Philippi *(Culex)*

IV. Wrongly Described as Anopheles.

annuliventris E. Blanchard—probably a male of *Culex* or *Aëdes.*

ferruginosus Wiedemann=*Culex quinquefasciatus* Say.

This list accounts for all the specific names found in the literature. As already indicated, these have been combined with the various generic names in a multiude of different combinations. It will be noted that some of the synonymy above indicated differs radically from that published by various authors. These changes are the result of careful studies, by Dr. H. G. Dyar and the writer, of the literature and of extensive material which have inevitably produced these results.

We have, then, thirty-four valid species of *Anopheles,* and to these possibly a very few will be added by collecting in more remote localities, particularly of South America. Of this number eight, or less than one-fourth, have been indubitably shown to be connected with the transmission of malaria. Others may yet be proved potential hosts of the malarial parasites. Indeed, in some cases this is to be expected. Other species have been studied sufficiently to warrant the conclusion that they are not efficient hosts of the malarial parasites. Such, for example, are *Anopheles punctipennis* in the United States and *Anopheles malefactor* in Panama. The American *Anopheles,* for which the malarial relation has been definitely established, are:

albimanus,	*quadrimaculatus,*
argyritarsis,	*pseudomaculipes,*
crucians,	*pseudopunctipennis,*
intermedium,	*tarsimaculata.*

It will be noted that two species which are generally listed as malaria transmitters are here omitted. These are *Anopheles punctipennis* and *Anopheles boliviensis (lutzii* Theo.). The record for *Anopheles punctipennis* is based upon its inclusion, by the late Dr. J. W. Dupree, in a list of efficient hosts of the malarial parasites, with the statement that the relation had been

Digitized by Google

determined by himself.[4] Other investigators have found this species uniformly negative toward the malarial parasites and it has been difficult to account for this discrepancy. Howard, Dyar and Knab have suggested that the species may be an efficient host of only one type of malaria and that positive results may depend upon the presence of this particular form of malaria.[5] It seems more likely that an error has been made, and recently Dr. C. S. Ludlow has suggested to me the possible explanation. She has received from Louisiana *Anopheles pseudopunctipennis,* a species which was unknown to Dr. Dupree and which greatly resembles *Anopheles punctipennis.* It seems plausible that Dr. Dupree had failed to differentiate the two species and that the form found by him to be an efficient host of the malarial parasites was in reality *Anopheles pseudopunctipennis,* which has since been shown to be a malaria transmitter. The case of *Anopheles boliviensis (lutzii* Theo.) I have considered elsewhere.[6] Suffice it to say here that the claim of Dr. Lutz is based solely upon inference and that Galli-Valerio, who claims to have found oöcysts of the malarial parasite in badly damaged specimens of this species, cannot be accepted as authoritative in the determination of American mosquitoes.[7]†

A fact that has not been sufficiently considered is that the same species of mosquito may behave differently toward the different species of malarial parasites. Thus Prof. Geo. E. Beyer and his co-workers, investigating at New Orleans, concluded that *Anopheles crucians* acts as the transmitter of æstivo-autumnal fever alone and remains negative with tertian and quartan parasites. *Anopheles quadrimaculatus* they found to be an efficient transmitter of tertian and quartan malaria, but inefficient with æstivo-autumnal.[8] Whether these studies were sufficiently comprehensive to warrant the conclusions of the authors, further investigations must determine. They have, perhaps, been looked upon by many as insufficiently founded or even fanciful, but similar results have been obtained quite independently in another part of the world.

Kinoshita, studying the malaria problem in connection with the Japanese occupation of Formosa, found that in that island

†See also the comments on this subject by Dr. Arthur Neiva in Memorias Inst. Oswaldo Cruz, vol. 1, p. 76, 1909.

Digitized by Google

the occurrence of æstivo-autumnal malaria is linked inseparably with the presence of *Anopheles listoni*. "Every epidemic of *Malaria tropica* depends upon the increase and decrease of *Anopheles listoni*. * * This mosquito develops very abundantly between the months of April and October. The new infections of tropical malaria begin, also, about the end of April and reach the highest number between June and July. *Anopheles listoni* is generally more abundant in mountainous regions than on the coast, and the distribution of tropical malaria corresponds. Taihoku, where *Anopheles listoni* does not occur, is therefore free from tropical malaria." Furthermore, according to Kinoshita, *Anopheles listoni* does not occur in Japan and æstivo-autumnal malaria is not endemic there. Although persons suffering with æstivo-autumnal malaria frequently come to Japan, no cases of the disease originate in the islands.[9]

A most interesting subject is the relation of the habits of the different species of *Anopheles* to malaria transmission. As far as we know, the species of *Anopheles* are all blood-feeders, but they have the appetite for blood developed to different degrees. Schüffner, in Sumatra, found that a certain species of *Anopheles* could not be induced to suck blood. Another species found by him showed an intense voracity. Once they had begun to suck it was almost impossible to dislodge them. "The voracity of the animals is incredible. An ordinary Culex, after it has sucked its fill, flies away. These *Anopheles*, however, are not discharging the surplus through the anus. At first they dissatisfied with this, but continue to suck, making more room by charge the fæces and intestinal liquid, but afterwards, drop by drop, pure blood follows. So, before it chooses to fly away, it flushes its digestive tract with three to four times the amount of blood which would have been necessary to fill its stomach." Most significant is the fact that this bloodthirsty species proved to be a malaria transmitter.[10] It will be readily understood that frequency of blood meals increases the chances for acquiring the parasites.

On the Isthmus of Panama a practice has been made of capturing the *Anopheles* which have entered dwelling houses in quest of blood. The determination of the species of mosquitoes

Digitized by Google

present and of their relative abundance can be taken as an index of the degree of adaptation to the blood diet. Darling found that at Ancon, during October, 1908, *Anopheles albimanus* constituted 72.5 per cent of all the *Anopheles* captured in houses, and in some settlements it was the only species present. This is significant in view of the fact that *Anopheles pseudopunctipennis* is also a very common species and yet it occurred in the houses in relatively very small numbers. Parallel with this difference in the development of the appetite for blood is the difference in the relation of the two species in malaria transmission. Darling found that 70.8 per cent of *Anopheles albimanus* induced to bite malarial patients became infective; while with *Anopheles pseudopunctipennis* only 12.9 per cent could be infected.[11] Of course it by no means follows that because a species of *Anopheles* shows a strong appetite for blood it will necessarily prove to be a malaria transmitter. Nevertheless the efficient hosts of the malarial parasites are to be sought among such species; in fact, it is hardly logical to expect the development of the malarial parasites in species which have not a well-fixed appetite for blood and which are not to a degree associated with man, for, viewed from a purely scientific standpoint, the *Plasmodia* are parasites requiring two definite alternate hosts—man and certain species of *Anopheles*. Such a precise adaptation of the parasite betrays a very fine adjustment and this could only have come about by the previous association of the two hosts. To be sure, none of the *Anopheles* are "domestic" in the sense of our house mosquitoes *(Culex pipiens, C. quinquefasciatus* and *Aëdes calopus)*, and this is not necessary. The long presence of the malarial parasites in the human circulation and the consequent frequent opportunity for the mosquito to acquire the infection compensates for a much looser association. But that certain species of *Anopheles* are to a degree "domestic" and others "wild," showing no association with man, was already pointed out by James and Liston.[1] As I have discussed this question of association in another paper it need not be presented here in detail.[6] Before leaving it, however, an interesting case of the adjustment of a species of *Anopheles* to man should be noted. Foley and Yvernault found that in Saharan oases *Anopheles*

Digitized by Google

chaudoyei is the only species present. Through the physical conditions the association of this mosquito with man is obligatory and it is noteworthy that with it, just as with the highly domestic yellow fever mosquito, the attack is noiseless and the bite painless.[12] Evidently in both these mosquitoes natural selection has brought about the unobtrusive mode of procuring blood from man.

The foregoing remarks might be easily construed to imply a preference for human blood on the part of the *Anopheles* more closely associated with man. Such has not been shown to be the case, although it by no means follows that it does not exist. Doubtless human blood is often the most easily available and abundant food supply, particularly with the species that thrive in the neighborhood of human habitations, and there is thus ample opportunity for the development of the preference. Mühlens, investigating malarial conditions on the North Sea coast of Germany, studied the food habits of *Anopheles maculipennis*, which was there the important species. He found that the females assembled in large numbers in the stables of cattle and particularly of hogs. In such cases determination of the stomach contents by Uhlenhut showed that such *Anopheles* had fed exclusively upon the animals with which they were associated. On the other hand, where malarial epidemics occurred, often restricted to a single house or a few neighboring houses, it was found that the *Anopheles* did not wander about, but remained in that particular locality and continued to feed upon the persons in the houses.[13]

Another factor that may enter into the malaria relation is the relative longevity of different species of *Anopheles*. Darling shows that *Anopheles albimanus* is much more hardy and in confinement will considerably outlive its two principal competitors for human blood, *Anopheles pseudopunctipennis* and *Anopheles malefactor*. It can be easily seen how this fact in itself increases the opportunities for the development of the parasites within the mosquito, and for their subsequent transmission to man.

A factor which may largely govern the question of the species concerned in malaria transmission is their local distribution

Digitized by Google

as governed by topographic conditions. Thus geographically *Anopheles albimanus* (with its race *tarsimaculata*) and *Anopheles argyritarsis* show practically the same distribution. Yet the two species have a different rôle as malaria transmitters in different localities. On the Isthmus of Panama *Anopheles albimanus* is the principal transmitter of malaria, *Anopheles argyritarsis,* although present, being negligible. We are informed by Dr. Lutz that in southern Brazil *Anopheles argyritarsis* is the most important transmitter of malaria. The explanation lies in the topographic conditions of the two regions. *Anopheles albimanus* breeds in standing water and thrives best in swamps of brackish water, and such conditions abound on the Isthmus. *Anopheles argyritarsis,* on the other hand, prefer pools of clear water in stream beds, and in southern Brazil such conditions predominate.

Enough has now been said to show that no phase of the study of *Anopheles* should be neglected. In the question of malaria prophylaxis exact knowledge of the habits of the different species is even more important. Experiences in the American tropics show that where large numbers of men are assembled in a malarious region, as in the carrying out of great engineering projects, the control of malaria with quinine is quite impossible. This necessitates its conquest through the control of the mosquito. Marked success along this line has followed the thorough work of our sanitarians on the Isthmus of Panama.[11] It is not too much to say that by this work alone has the construction of the interoceanic canal been made possible.

References.

(1) James, S. P., and W. Glenn Liston. A monograph of the Anopheles Mosquitoes of India . . Calcutta, 1904. 132 pp.

(2) de Vogel, W. Th. Anophelines dans l'eau de mer. Atti Soc. per gli Studi della Malaria, 1907, viii, pp. 1-18.

(3) Lukis, C. P. Presidential address delivered at the second meeting of the General Malaria Committee, held at Bombay on November 16, 1911. [Abstract.] Jour. Trop. Med. and Hyg., 1912, xv, pp. 30-31.

(4) Dupree, J. W. The mosquitoes of Louisiana and their pathogenic possibilities, with remarks upon their extermination. New Orleans Med. and Surg. Jour., 1905, lviii, pp. 1-16.

(5) Howard, L. O., Harrison G. Dyar, and Frederick Knab. The Mosquitoes of North and Central America and the West Indies, 1913, i, p. 203.

(6) Knab, Frederick. Unconsidered factors in disease transmission by blood-sucking insects. Jour. Econ. Ent., 1912, v, pp. 196-200.

——— Dr. Lutz's contentions regarding "forest malaria." To appear in Proceedings Entomological Society, Washington, 1913.

Digitized by Google

(7) Galli-Valerio, B. Sur la presence d'oocystes chez Anopheles Lutzii, Theobald. Centralbl. f. Bakt., 1904, xxxv, p. 85.

(8) Beyer, G. E., O. L. Pothier, M. Couret, and I. I. Lemann. Bionomics, experimental investigations with Bacillus sanarelli, and Experimental Investigations with Malaria in connection with the Mosquitoes of New Orleans. N. O. Med. and Surg. Jour., 1902, liv, pp. 419-480.

(9) Kinoshita, K. Uber die Verbreitung der Anophelen auf Formosa und deren Beziehungen zu den Malariakrankheiten. Arch. f. Schiffs—u. Tropen-Hyg., 1906, x, pp. 621-645, 676-684, 708-726, 741-754.

(10) Schueffner, Wilhelm. Die Beziehungen der Malariaparasiten zu Mensch und Muecke an der Ostkueste Sumatras. Zschr. f. Hyg. u. Infekt., 1902, xli, pp. 89-122.

(11) Darling, Samuel T. Transmission of Malarial Fever in the Canal Zone by Anopheles mosquitoes. Jour. Amer. Med. Assoc., 1909, liii, pp. 2051-2053.

——— Studies in relation to malaria. Isthmian Canal Com., Lab. Board of Health, Dept. Sanit., 1910, pp. 38.

(12) Foley, F. H., and A. Yvernault. Campagne antipaludique dans une oasis Saharienne, à Beni-Ounif (Sud-Oranais), en 1908. Malaria, 1909, i, pp. 164-182.

(13) Muehlens, P. Beiträge zur Frage der gegenwärtigen Verbreitung der Malaria in Nordwestdeutschland. Deutsche Med. Wochenschr., 1902, xxviii, pp. 589-591, 605-608.

——— Ueber einheimische Malariaerkrankungen in der Umgegend von Wilhelmshaven und ihre Bekämfung. Arch. f. Schiffs-u. Tropen-Hyg., 1908, v, pp. 58-70.

——— Malariabekämpfung in Wilhelmshaven und Umgegend. ii. Arch. f. Schiffs-u, Tropen-Hyg., 1909, Beiheft vi, pp. 166-173.

Discussion.

Dr. Creighton Wellman, New Orleans: A study of the list of mosquitoes which have been published as being indigenous to New Orleans makes one suspect that a great deal of careless determination of species has occurred. The careful determination of species and the locality in which they occur cannot be too particularly insisted upon.

Dr. Malcolm Watson, Klang, Federated Malay States: It is quite important to determine the species of Anopheles mosquitoes found in certain localities. It is useless to say that because Anopheles mosquitoes are present, therefore malaria must also be present. In the Federated Malay States the determination of species is absolutely essential if anti-malarial measures are to be successful and economical. In Malaya two kinds of land are found in which anti-malarial measures must be carried out, the low-lying land, much of it below the level of tide water, and the hill land. In the former it is impossible to give a guarantee that malaria will disappear after certain drainage measures have been carried out. In the high land, on the other hand, where other species of anopheles are present, it is very difficult to get rid of the mosquitoes and also of malaria. It has been frequently necessary to conduct streams through underground conduits in order to rid them of mosquitoes. We cannot say from experience in one country what sanitary measures will be required in another.

Dr. C. S. Ludlow, Washington: *Myzomyia ludlowi* is not thought to breed in fresh water; but the specimens from which the species was originally named were taken from fresh water. There is a species of malaria-carrying mosquito in the Philippine Islands which breeds in soap-suds water.

Dr. H. R. Carter, Baltimore: The determination of Anophelines is frequently of importance in telling the sanitarian what he need not do. For instance, *Anopheles malefactor*, which breeds in collections of water in hollow stumps on the Isthmus of Panama is not a malaria carrier, and this knowledge is estimated to have saved the Canal Commission from $150,000 to $200,000 in its anti-malarial work.

Dr. Edward R. Stitt, Washington: At Canacao no malaria-carrying mosquito other than *Myzomyia ludlowi* is found. The highest salt content of the water at that place was 400 parts per million.

Dr. Elmer F. Otis, Peñuelas, Porto Rico: Malaria is restricted to the coast regions in Porto Rico, with one exception. In the hilly region in which malaria is present the disease is brought from the coast by the natives who travel from the latter to the former.

Digitized by Google

SOME OBSERVATIONS ON THE PREVALENCE OF INTESTINAL PARASITES IN THE PHILIPPINE ISLANDS.*

ELMER S. TENNEY, B. L., M. D.,
First Lieutenant Medical Reserve Corps, U. S. Army, Camp Bumpus, Tacloban, Leyte, P. I.

In 1912 I reported the results of the examination of the stools of a company of Philippine Scouts.[1]

Since that time I have kept a record of all stools examined, comprising 121 Filipinos, 27 Moros, 2 Chinamen and 21 Americans; and, while there is nothing particularly new or striking in the findings, it may be of interest to briefly record them.

In the examination of the 100 Philippine Scouts previously mentioned the results and percentages are as follows:

Ascaris lumbricoides	52
Trichuris trichiura	48
Uncinaria	24
Trichomonas	1
Negative	15

In the following figures I have included the 2 Chinese and the 27 Moros (enlisted men of the Philippine Constabulary) with the 121 Filipinos, as the general conditions in which they lived were about the same.

The list below shows the actual number of infections found in the 150 persons examined, and also the percentage of each:

Trichuris trichiura	67	44.6%
Uncinaria	50	33 %
Ascaris lumbricoides	48	32 %
Trichomonas	15	10 %
Stronglyoides stercoralis	5	3.3%
Entamœba histolytica	3	2 %
Dibothriocephalus latus	1	.6%
Negative	20	13 %

*Read by title at the Tenth Annual Meeting of the American Society of Tropical Medicine, held at Washington, May 6, 7, and 8, 1913.

Digitized by Google

In this work no attempt has been made to differentiate *Necator americanus* from *Agchylostoma duodenale,* and both are tabulated under the heading of "Uncinaria."

The three cases of *Entamœba histolytica* were actual clinical cases of dysentery.

A complete record of results for *Entamœba coli* was not kept and therefore no figures are given.

It will be noted that *Ascaris lumbricoides* infection is 20% less than it was in the Scout series. In the examination of 119 male Igorot laborers Chamberlain, Bloombergh and Kilbourne found an *Ascaris lumbricoides* infection of 73%.

Probably there is an average of from 50% to 75% infection with this parasite throughout the islands.

The present series shows a *Trichuris trichiura* infection of 44.6%, as compared to 48% in the Scout series, and 60% in the Igorot series of Chamberlain, Bloombergh and Kilbourne.

On the other hand, the *Uncinaria* infection is 9% higher than that of the Scout series, but 2% less than that found among the Igorots.

A combination of my two series, including a total of 250 cases, should give a somewhat truer average and is shown below:

Trichuris trichiura	115	40 %
Ascaris lumbricoides	100	40 %
Uncinaria	64	25.6%
Trichomonas	16	6.4%
Strongyloides stercoralis	5	2 %
Entamœba histolytica	3	1.2%
Dibothriocephalus latus	1	.4%
Negative	35	14 %

The percentages here shown are below those generally given for these islands, but this discrepancy may, probably, in part, be accounted for by the fact that five-sixths of the 250 were enlisted men of the Philippine Scouts or of the Philippine Constabulary and were, therefore, picked men living under far better sanitary conditions than the average native. Then again, while all of the above species are probably to be found in nearly all parts of the Philippines, the actual degree of prevalence varies greatly. For example, there are certain localities where

Digitized by Google

Entamœba histolytica is frequently encountered and where dysentery abounds; and there are other localities where almost no dysentery is to be found. It is, therefore, to be expected that different series from different localities will vary considerably.

The presence of two or more species of parasites in one person is very frequent, a concurrent infection with *Trichuris trichiura* and *Ascaris lumbricoides* being most often met.

In order the more clearly to show the great prevalence of intestinal parasites in the Philippines, if indeed anything more is needed, I will give the figures found by Stiles and Garrison[3] in 1906. These authors attempted "to determine the frequency and species of intestinal worms present in man in at least two localities in the United States," and they examined 3457 persons. "These persons were inmates of the United States Government Hospital for the Insane (St. Elizabeth) and an orphanage, both of which are in the District of Columbia, and of the Connecticut Hospital for the Insane at Middletown, Conn." Of the 3457 persons, 349 were infected with intestinal worms, an average of 10.10%; 35 of the 349 infected persons harbored 2 species of parasites, and 1 person was infected with 3 species, making a total of 386 infections, or an average of 11.17 infections per 100 persons. Seven species of worms were found. They occurred in the following order of frequency: Whipworms, *Trichuris* (7.69%), pinworms, *Oxyuris* (1.30%), hookworms (1.04%), eelworms, *Ascaris* (0.49%), dwarf tapeworms, *Hymenolepis nana* (0.35%), Cochin China worms, *Strongyloides* (0.23%), beef tapeworms, *Taenia saginata* (0.06%).

Stiles and Garrison say that their figures are much lower than the rates reported for these parasites from other similar investigations, but when one considers the character of work always done by these investigators and the large number of persons examined, and also the fact that all of their work was done on inmates of institutions for the insane, where if anything the prevalence would tend to be greater, it would seem that their figures are probably not far from correct. One has only to compare the figures in the two series for a given species in order to realize the conditions to be found here.

In this connection it may be of interest to give the findings

Digitized by Google

in the examination of the stools of the 21 American residents of the islands; they included officers of the Army and of the Philippine Constabulary, as well as several women and children; none had been in the islands for less than one year and most of them had been here much longer.

Entamœba histolytica	3	14 %
Entamœba coli	3	14 %
Trichuris trichiura	2	9.5%
Ascaris lumbricoides	2	9.5%
Trichomonas	2	9.5%
Uncinaria	1	4.7%
Oxyuris vermicularis	1	4.7%
Strongyloides stercoralis	1	4.7%
Larvæ of *Musca vomitoria*	1	4.7%
Negative	8	38 %

While the number of Americans examined were very few, they were from a variety of occupations and may be presumed to be fairly representative of Americans (in poor health) in these islands.

In this place it should be stated that while fully three-fourths of the natives were in good physical health when examined, all of the Americans were known to be in more or less poor health, and in several instances seriously ill.

While these figures are much higher than those of Stiles and Garrison for the United States, it is very evident that this should be so, for, while the average American manages to get good, clean food, and distilled water for drinking, and otherwise tries to safeguard his health, and to avoid the various parasitic infections so common to the natives, there are many sources of infection to which he is unavoidably exposed here, which do not exist at home, and for this reason we should therefore look for higher percentages here.

But when we compare the figures for Americans in these islands with the figures for the natives in the same localities we see that there is a tremendous difference.

Probably the percentage of dysentery cases among Americans here will more nearly approach the native figures than that of almost any other parasitic infection.

Digitized by Google

One American, (an officer of the Philippine Constabulary), who had recently seen long, hard field service in Mindanao, showed *Uncinaria, Trichuris trichiura* and the larvæ of *Musca vomitoria* (the ordinary "blue-bottle" fly); the others as a rule showed but one species of parasite. The larvæ of *Musca vomitoria* above mentioned were discovered more or less by accident; the patient had suffered from considerable diarrhœa for several days, and upon finding the ova of *Necator americanus* he was at once put upon the thymol treatment. In the stools following this treatment about half a dozen small white objects were noticed, which upon examination were found to be larvæ.

The *Strongyloides* infection, (in an American army officer), was the cause of a long-continued entero-colitis in which there were usually one or two pale yellow fermented stools per day. There was progressive weakness and loss of weight, attended with considerable abdominal pain. This infection proved to be very resistant to treatment, and is especially mentioned here because of the fact that it is usually stated that this parasite produces few or no symptoms.

While the figures given in the first part of this paper showed 14% of negatives in the case of the natives, these were somewhat exceptional natives;* and if a large number of average natives had been examined, I doubt if more than 5% to 6% would have been negative after careful examination.

The mode of life of the native is such that it is a practical impossibility for him to be free from one or more species of intestinal parasites, and frequently it is more rather than one.

These parasites are as regular tenants of the native's intestine as the dog, the chicken and the pig are of the house in which he lives.

References.

(1) E. S. Tenney. "Blood and Stool Examinations in a Company of Philippine Scouts." Bos. Med. and Sur. Jour. 1912, clxvii. 4.

(2) W. P. Chamberlain, H. D. Bloombergh, and E. D. Kilbourne, U. S. Army. "Examinations of Stools and Blood Among the Igorots at Baguio, Philippine Islands." Phil. Jour. of Sci., Sec. B., 1910, v. No. 5.

(3) C. W. Stiles and P. E. Garrison. "A Statistical Study of the Prevalence of Intestinal Worms in Man." Hyg. Lab. Bull. No. 28, August, 1906.

*The author undoubtedly refers to natives of unusually cleanly habits.—Ed.

Digitized by Google

ON THE ADULT FORMS OF TRYPANOSOMA AMERICANUM IN NATURALLY INFECTED ANIMALS.*

FOSTER M. JOHNS, M. D.,
Assistant in the Laboratories of the School of Hygiene and Tropical Medicine, Tulane University, New Orleans.

Introduction.

While engaged with Bass in a series of experiments directed toward the cultivation *in vitro* of *Piroplasma bigeminum*, a trypanosome, remarkable for its size, was found in a blood smear from one of the cows used for experimental purposes.

Further examinations revealed the fact that this trypanosome was demonstrable in the fresh blood of all of the adult cattle, and a few of the yearlings, examined, from widely separated localities.

These cattle appeared to be entirely healthy.

The wide range of infection, the number of adults infected, and the clinical non-pathogenicity at once suggested that these trypanosomes were the adult forms of *Trypanosoma americanum*. This trypanosome may be cultivated from the blood of the majority of American cattle. In the course of the work it was found that the trypanosomes are in reality the adult forms of the parasites recognized in culture as *Trypanosoma americanum*.

The purposes of this paper are to present a description of the forms found in the blood of naturally infected animals, the technic for their demonstration; and the points brought out in the cultural studies.

Historical.

Lingard (1893), in India, reported finding a long and active trypanosome in the blood of a bull. This is not mentioned in one of his later papers (1904), when he describes a very large trypanosome in the blood of cattle in India which he used for his experiments on surra. This trypanosome was found once in a bull, five days after a second

*Received for publication May 5, 1913.

Digitized by Google

inoculation with surra; and on four occasions in a cow, also twice inoculated with surra. The length of this giant trypanosome is given as being from fourteen to twenty-three times, and the width from two and one-half to three and one-half times the diameter of the red blood corpuscle of cattle. The body of the trypanosome has a swelling near the posterior end, giving rise to a tadpole or spindle-shaped parasite. There is a well-developed undulating membrane extending almost to the posterior end. An oval nucleus is figured about the middle of the swollen portion. The blood of the cow on being injected into two guinea-pigs, gave rise to surra in both instances.

Holmes (1904) described a very large trypanosome in the blood of "hill" cattle, in India. These cattle were all more or less debilitated, or had been inoculated with rinderpest serum. This trypanosome was from 60 to 80 microns long, with a free flagellum 15 to 25 microns. The width was two to four microns. The posterior end was very pointed, and the kinetonucleus was located 10 to 17 microns from the tip.

Lingard (1907) described a trypanosome found in the "hill" cattle of India, which was similar to the one described by Holmes, and called it "*Trypanosoma himalayum.*"

Frank (1909) found trypanosomes in the spleen pulp of an ox in Germany, the animal having died of an infection supposed to be either anthrax or blackleg. The bacilli of neither of these diseases being found, Frank was inclined to blame the animal's death on the trypanosomes, but no proof was furnished.

Knuth (1909) made measurements of the trypanosomes from Frank's material. He gives the length as from 20 to 40 microns. According to this author, it more closely resembles *Trypanosoma theileri* than any other species.

Crawley (1909), in repeating Miyajima's (1907) observations on the trypanosomal form of the Japanese piroplasma in culture, cultured a trypanosome from the blood of American cattle. In a later paper, Crawley (1912) proves that this trypanosome has no relationship to the *Piroplasma bigeminum* of this country, and named it *Trypanosoma americanum*. He describes forms found in fresh blood averaging 16.8 by 3.8 microns, and records finding one specimen 20 microns long with a flagellum as long as the body, making a total of 40 microns. The characteristic points noted in the cultural forms were the situation of the trophonucleus, which is at the junction of the anterior and middle thirds; the kinetonucleus being close to the trophonucleus, and placed either in front of, alongside, or behind the latter; and a short undulating membrane.

Stockman (1910) found trypanosomes in 6 out of 10 English cattle which had been inoculated with *Piroplasma*. In one case the trypanosomes were present for eight days; in the other five, for only a day or

Digitized by Google

two. The trypanosomes were morphologically indistinguishable from *Trypanosoma theileri*, and would not grow in culture.

Knuth, Rauchbaar and Morgenstern (1910) found trypanosomes in 7 out of 25 cattle examined by means of cultures in Germany.

Behn (1910.a.) confirmed the presence of trypanosomes in German cattle; and in a smear of fresh blood found a single trypanosome, remarkable for its unusual breadth. He gives the following measurements:

	Microns.
Posterior end to middle of kinetonucleus	13
Middle of kinetonucleus to posterior end of trophonucleus	4
Anterior end of trophonucleus to anterior end of body	24
Trophonucleus	2
Length of body	43
Length of free flagellum	12
Total length	55
Maximum width	12

The trypanosome had the body sharply bent. The cytoplasm showed clear spaces and abundant granules. The granules were almost all of the same size, and stained from reddish to a blue-violet. Around the nucleus the cytoplasm was freer from granules than elsewhere. The kinetonucleus stained a black-violet, and lay in a clear region. The nucleus lay transversely, filling the entire width of the body. It stained a pale red. Behn (1910.c.), in a later paper, reports the inoculation of a calf from a cow whose blood gave positive cultures, but was negative to direct examination. Eleven days later the blood of the calf was positive to direct examination. For the first few days the trypanosomes seen were of *Trypanosoma franki* type, but later they took on the appearance of *Trypanosoma theileri*. Cultures made from the blood of this calf, after the trypanosomes had appeared, were positive.

Dudukalov and Dudukalova (1910) cultured trypanosomes from the blood of Russian cattle.

Sergent ,E., and E., (1911), made cultures from 82 cattle in Algiers. Trypanosomes were found in 9 of the cultures.

Technic for Demonstrating Adult Forms.

Five to ten c. c. of blood are drawn from the jugular vein. This is immediately run into tubes containing an equal amount of a solution containing Sodium citrate 1.5%, Sodium chloride 0.85%. The tubes are then centrifugalized until the leucocyte layer has separated from the column of red cells. This layer is then taken up with a capillary pipette having a very large

Digitized by Google

lumen. Enough of the supernatant fluid is usually taken up while removing the leucocytes to mix with the latter to form a suspension of about the consistency of normal blood. Fairly thick cover glass preparations are made. These are examined with the 16 m. m. objective.

The blood may be defibrinated by means of shaking in flasks containing coarse glass beads, or by stirring with a glass rod; but as the organisms are very large, many of them are caught in the fibrin, which lessens the chances of positive findings.

Technic of Cultivation.

For the general cultivation the technic recommended by Crawley gives the best results. One part of the defibrinated blood is added to three parts of neutral beef bouillon and incubated at a temperature of 20° to 22° C.

In the above media multiplication takes place very slowly, and much time is required to observe the transition from the adult to cultural forms. In the citrated blood, as prepared for demonstration of the adult forms, the organisms survive for from 24 to 30 hours, and rapid division takes place during the first 15 to 18 hours. During this time this transition can best be observed. Several tubes should be prepared and observations should be made at intervals of from 3 to 5 hours. One of the tubes is centrifugalized, the leucocyte layer is carefully removed and cover-slips and smear preparations are made. After from 15 to 18 hours the tubes remaining are centrifugalized, the leucocyte layer containing the dividing trypanosomes is transplanted to the surface of cell sediment in previously prepared blood-bouillon tubes. In these cultures development proceeds as in the regular blood-bouillon cultures.

Centrifugalization does not damage these early forms to any recognizable extent, for by the time cover-slip preparations can be prepared, and an organism can be found, the movements are as vigorous as those of organisms from cultures not centrifugalized.

Digitized by Google

Discussion.

Forty-three adult cattle and seven yearlings were examined directly. All of the adults and two of the yearlings were found infected. Thirty-one of the adults were from cattle shipped to the New Orleans abattoirs from the northern part of Mississippi and southeastern Louisiana; one bull brought down from Michigan, the examination being made three weeks after his arrival; two breed cows imported recently from Tennessee; and eight native dairy cows from Baton Rouge, Louisiana. All of the yearlings were from the abattoir stock.

The number of trypanosomes found varied from two to twenty-one in each ten cubic centimeters of the whole blood. These two figures were the extreme numbers found in naturally infected animals, the average being approximately eight. Examinations made of defibrinated blood in comparison with citrated blood always showed a much smaller number of trypanosomes.

In fresh, centrifugalized blood the adult forms of *Trypanosoma americanum* appear as large, actively motile, spindle-shaped bodies with an easily recognizable undulating membrane and flagellum. The cytoplasm appears uniformly hyaline with an occasional very refractile granule. The trophonucleus cannot be differentiated, while the position of the kinetonucleus is indicated by one of the refractile granules referred to above. Movement across the field of the microscope is very slow, the trypanosomes apparently picking their way between the clumps of leucocytes, while throwing the red cells aside with the flagellum or the extended posterior end. The parasite moves equally well with either end foremost, although the flagellar end usually precedes. There is very often a spiral motion of the whole body, this being especially noticeable when the posterior end becomes entangled in a clump of blood platelets, when these can be observed to rapidly revolve while being dragged along in the wake of the moving organisms. The posterior extremity possesses quite a degree of ameboid movement; sometimes it is thrown out into a long, deilcate process which vibrates from side to side, greatly resembling a true flagellum; and may then be retracted, gradually assuming a rounded or even knobbed ap-

Digitized by Google

pearance. When entangled in a mass of leucocytes there are observed periods of very violent motion alternating with shorter periods of almost complete rest, when only an occasional wave traverses the undulating membrane and ends in a twitch of the free flagellum. When actively trying to free itself the whole anterior end of the body, with the flagellum, furiously lashes the surrounding cells and the parasite can be observed twisting its body first one way, then the other, until the undulating membrane appears coiled about the body. The posterior end of the body is apparently fixed to the mass of leucocytes.

A study of the stained preparations shows the cytoplasm presenting a deeply stained, coarsely alveolar, appearance. There are a few granules of somewhat variable size, staining a blue-violet, and with no constant location. The posterior end may have the shape of a truncated cone (Fig. I), or gradually taper to a point (Fig. II). The extreme posterior tip stains bluish-violet to a light lavender; and in some (Fig. IV) this is well differentiated from the blue staining cytoplasm. This is probably due to a continuation of the ectoplasmic layer described in *Trypanosoma lewisi* by Wasielewski and Senn (1900), and confirmed later by Prowazek (1908). This ectoplasmic layer may also be seen in the early cultural forms. The trophononucleus is situated just posterior to the middle of the body proper. It is in the form of a band, filling the entire width of the body, and stains a reddish-lavender. The kinetonucleus, situated ap proximately one-third of the distance from the posterior border of the trophonucleus to the posterior end is oval in shape, stains a deep violet, and lies in a well-defined vacuole. In some instances the kinetonucleus appears to be located very superficially in the cytoplasm (Fig. IV). The flagellum is free anteriorly and joins the undulating membrane midway between its free extremity, and the anterior end of the body is continued posteriorly along the whole length of the undulating membrane, and extends back to the kinetonucleus; although, it appears to be separated from the latter by a small clear space in these forms not undergoing division. It stains a reddish-violet. The undulating membrane is ample, and is projected along the flagellum beyond the anterior end of the body. This projection

Digitized by Google

can be distinctly seen in the ordinary preparations extending approximately one-half the distance between the free extremity of the flagellum and the anterior end of the body. It stains a light red to a reddish-lavender, and occasionally presents a few reddish-violet granules of slightly variable size. The presence of either myonemes, or reinforcing striae in the undulating membrane, has not been observed in my preparations.

As regards these different forms found in the fresh blood, it is probable that we have here analogues of the "male" and "female" forms described in *Trypanosoma lewisi* by Prowazek (1908), Fig. I representing the "female," and Fig. II the "male," for in citrated blood kept at room temperature for 9 to 12 hours all of the forms represented by Fig. I have divided and sub-divided, while those represented by Fig. II show no division up to 28 hours, when they have become very granular, lose their ability to stain, and disappear. The analogue of the "indifferent" form he describes has not been found. The forms represented by Figs. III and IV have been found in division, so that they represent either the normal variation in size of the adult, or immature forms from multiplicative processes in the parasitized animal.

In the citrated blood, kept at from 20° to 22° C., the process of division and redivision can readily be followed. The trypanosomes become broader and less active. The nuclear material becomes somewhat granular, while the kinetonucleus and vacuole move toward the trophonucleus (Fig. V). The kinetonucleus divides, and the two portions go to opposite sides of the vacuole. At the same time the root of the flagellum divides up to the undulating membrane. The trophonucleus becomes oval, and presents a very granular appearance, the granules being arranged about definite areas that do not stain. The cytoplasm begins to show cleavage toward the posterior end, while centrally the stained preparations show a very loose texture (Fig. VI). Division of the nucleus soon follows, the resultant segments being of about the same size. At the same time the protoplasm is found almost completely divided posteriorly (Fig. VII). Complete division of the protoplasm and separation of the division segments of the flagellum now occurs. The daughter is some-

Digitized by Google

what smaller than the mother cell, and possesses a very short flagellum, which rapidly increases in length without a demonstrable undulating membrane (Fig. VIII). The time necessary for this first complete division is from 5 to 7 hours. Division of the mother and daughter cells now follow; the mother dividing, with reference to the flagellum, as previously described, while the daughter divides by equal fission, the flagellum dividing along its whole extent (Figs. IX and X). Just what is the future development of the form retaining the original flagellum and undulating membrane, has not been determined. The remaining forms rapidly divide, the products of this division showing a very pale staining nucleus (Fig. XI). This is the usual extent of development in citrated blood up to 15 hours. If at this stage the organisms are now transferred to blood-bouillon media, in from 5 to 10 hours the groups of very small flagellated forms noted by Crawley (1909) are found. These show only the cytoplasm and kinetonucleus to ordinary staining. Wright's stain followed by Giesma for 12 hours brings out the flagellum, which can also be demonstrated in the fresh preparation. At the same time the "euglenoid" forms that Crawley (1912) mentions may be found (Fig. XII). The significance of these forms in the transition of the trypanosome to the cultural type cannot be stated at present. From this stage the organisms continue to develop in the usual manner, attaining the characteristic forms described by Crawley (Fig. XIII). These have the trophonucleus situated approximately at the junction of the anterior and middle thirds of the body. The kinetonucleus is placed alongside, in front of or behind the trophonucleus. There is also a relatively short undulating membrane.

Summary.

Trypanosoma americanum lives in the blood of American cattle as a typical trypanosome. By proper technic this trypanosome may be demonstrated in the fresh blood of all infected animals. Different forms analogous to the "male" and "female" forms as described for other trypanosomes may be demonstrated. In suitable media these trypanosomes show the char-

Digitized by Google

acteristic morphology described for cultural forms of *Trypanosoma americanum.*

Conclusions.

1. The trypanosomes described by Crawley (1909-1912) from cultural forms may be found in the circulating blood of naturally infected cattle.

2. The single specimens encountered by Behn (1910-a) and Crawley (1912) probably belong to this species.

The writer wishes to thank Dr. A. J. Martin, in charge of the Government inspection at the New Orleans abattoirs, for the opportunity of examining the cattle mentioned in this paper, and Professor Creighton Wellman and Dr. C. C. Bass for interest and advice during the course of the experiments.

References.

Lingard, A. Report on Horse Surra, 1893, ii, part i, p. 83.

Wasielewski, Th. von, and Senn, G. Beitrage zür Flagellaten des Rattanblutes, 1900, Ztschr. fur Hyg. und Infekt., xxxiii, pp. 444-472.

Lingard, A. The Giant Trypanosoma Discovered in the Blood of Bovines. Centr. für Bakter., 1904, Orig. xxxv, pp. 234-238.

Holmes, J. D. E. Tryponosomiasis among Cattle of India. Jour. of Comp. Path. and Ther., 1904, xvii, pp. 317-326.

Lingard, A. Different Species of Trypanosomata Observed in Bovines in India, Jour. of Trop. Veter. Sci., 1907, ii, pp. 4-50.

Miyajima, M. On the Cultivation of a Bovine Piroplasmata: A Preliminary Communication. Phil. Jour, Sci. Bul. Med. Sci., 1907, ii, pp. 83-92.

Dutton, J. E., Todd, J. L., and Tobey, E. N. Concerning certain Parasitic Protozoa Observed in Africa. Seventh Interim Report from the Expedition of the Liverpool School of Tropical Medicine to the Congo, 1903-04-05, part i, Liverpool School of Tropical Medicine, 1907, Memior xxi, p. 87.

Prowazek, S. von. Studien ueber Säugetier-trypanosomen. Arb. Aus Dem Kaiser, Gesund. 1908, xxii, pp, 351-395.

Martini, Erich. The Development of a Piroplasma and Trypanosoma of Cattle in Artificial Culture Media, Phil. Jour. Sci., 1909, iv, pp. 147-169.

Frank, G. Ueber den Befund von Trypanosomen bei einem in Stein-Wingert. (Westerwald, Regierungsbezirk Weisbaden) verendeten Rinde. Ztschr. fur Infekt. . . . d. Haust., 1909, v, pp. 313-315.

Knuth, P. Ueber die Morphologie des Trypanosoma Frank. Ztschr. f. Infekt. . . . d. Haust., 1909, vi, pp. 39-45.

Crawley, Howard. Studies on Blood and Blood Parasites. (U. S. Dept. Agri., Bureau of Animal Industry, 1909, Bul. 119, pp. 21-31.)

Stockman, S. Preliminary Note on a Trypanosome of British Cattle. Jour. Comp. Path. and Therap., 1910, xxiii, pp. 89-192.

Knuth, Paul; Rauchbaar, Gustav; Morßenstern, Paul. Nachweis von Trypansomen bein Rinde in Kriese Oberwesterwald mittelst Zuchtung in Blut-Bouillon Vorläufige Mitteilung. Berl, tierarztl. Wchnschr., 1910, xxvi, pp. 539-540.

Knuth, Paul; Rauchbaar, Gustav. Zum Vorkommen von Trypansomen bei Rindern in Deutschland. Zweite vorlaufige Mitteilung. Berl. Tierarztl. Wchnschr., 1910, xxvi, pp. 609-610.

Digitized by Google

Knuth, Paul. Über die in deutschen Rindern gefunden Trypanosomen. Berl. tieraztl. Wchnschr., 1910, xxvi, pp. 810-811.

Behn, Paul. Über Entwicklungsformen des Trypanosoma franki. Berl. tierarztl. Wchnschr., 1910, xxvi, pp. 809-810.

———— Praflägellate Entwicklungsstadien der in deutschen Rindern kulturell nachweisbaren Trypanosomen. Berl. tieraztl. Wchnschr., 1910, xxvi, p. 899.

———— Infektion eines Kalbes mit Trypanosomen vom Typus des Trypanosoma theileri mittelst Blut von Kuhen, in denen nur kulturell Flagellaten nachweisbar waren. Berl. tierarztl. Wchnschr., 1910, xxvi, pp. 998-1000.

Schmitt, F. M. Zum Vorkommen ven Trypanosoma theileri in deutschen Rindern. Berl. tieraztl. Wchnschr., 1910, xxvi, pp. 841-842.

Dudukalova, A.; Dudukalova, N. Ob iskusstvennon Kultivirovanii tripanozom maidenykh u rogatago skota. Sooshchenie vtoroe. Ark. vet. nauk., 1910, xl, pp. 1-4.

Sergent, Edmund, and Etienne. Présence de trypanosomes chez les bovides en Algerie. Bul. Soc. path. exot., 1911, iv, pp. 40-42.

Delanoë, P. Presence de trypanosomes chex les bovides en France. Bul. Soc. path. exot., 1911, iv, pp. 112-116.

Crawley, Howard. Trypanosoma americum, a common Blood Parasite of American Cattle. U. S. Dept. Agri., Bureau of Animal Industry. Jan. 17, 1912, pp. 1-39.

Explanation of Plate.

The illustrations accompanying this paper have been drawn with the aid of the camera lucida, the objects being traced at the level of the desk top. The magnification has been determined as accurately as possible to be 1900 diameters, and is uniform throughout. The dimensions given have been determined by tracing the stage micrometer (1 mm. in 100) upon paper with the camera lucida, and by means of a micrometer ocular. Leitz objective 2 mm., and ocular 4 were used.

Fig. I. Form from fresh blood. I*, 28 microns; II, 9 microns; III, 3.5 microns; IV, 30 microns; V†, 26.5 microns; VI, 10.5 microns.

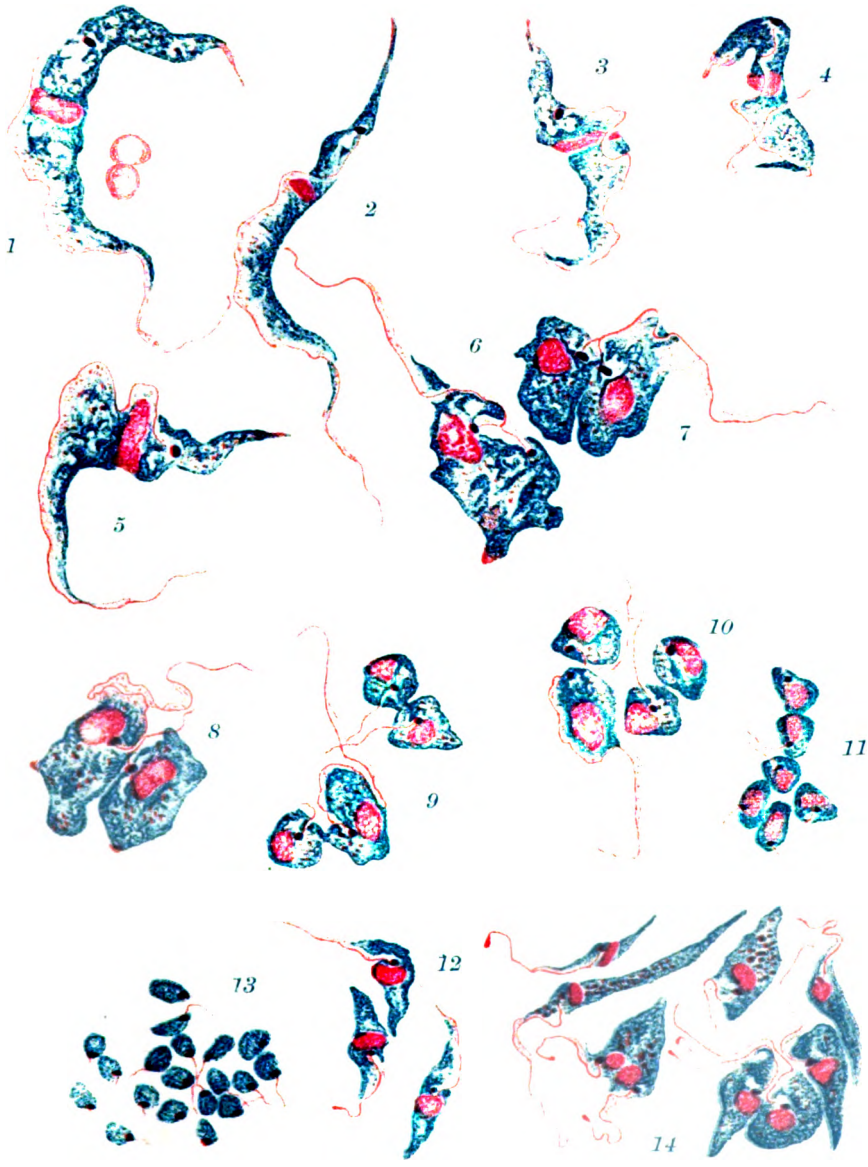
Fig. II. From fresh blood. I, 19 microns; II, 10 microns; III, 3 microns; IV, 32 microns; V, 27.5 microns; VI, r microns. III, 3 microns; IV, 32 microns; V, 27.5 microns; VI, 4 microns. III, 2 microns; IV, 25 microns; V, 15 microns; VI, 8.5 microns.

---

*The Roman numerals, by which the measurements of trypanosomes are indicated, refer to those measurements which are taken in ercording the dimensions of trypanosomes (Dutton, Todd, and Tobey, 1907). They are: I, posterior extremity to center of kinetonucleus; II, center of kinetonucleus to posterior border of nucleus; III, posterior to anterior border of nucleus; IV, anterior borde rof nucleus to anterior extremity of cytoplasm; V, length of free flagellum; VI, greatest body width, without undulating membrane.

†This measurement includes a portion of the undulating membrane produced upon the flagellum beyond the basic straining cytoplasm of the body.

Digitized by Google



Johns

Trypanosoma Americanum

Digitized by Google

Digitized by Google

Fig. IV. From fresh blood . I, 16 microns; II, 7.5 microns; III, 4 microns; IV, 17.5 microns; V, 16 microns; VI, 5.5 microns.

Fig. V. From citrated blood, 22° C., 3 hours.

Fig. VI. From citrated blood, 22° C., 6 hours.

Fig. VII. From citrated blood, 22° C., 7 hours.

Fig. VIII. From citrated blood, 22° C., 8 hours.

Fig. IX. From citrated blood, 22° C., 11 hours.

Fig. X. From citrated blood, 22° C., 12 hours.

Fig. XI. From citrated blood, 22° C., 15 hours.

Fig. XII. From citrated blood, 22° C., 15 hours.

FIG. XIII. From blood-bouillon 6 hours, after 15 hours in citrate, 22° C.

Fig. XIV. From blood-bouillon 8 days, after 15 hours in citrate, 22° C.

Digitized by Google

THE SURGICAL TREATMENT OF ELEPHANTIASIS AND ELEPHANTOID STATES DEPENDENT UPON CHRONIC OBSTRUCTION OF THE LYMPHATIC AND VENOUS CHANNELS.*

RUDOLPH MATAS, M. D.,
With Case Reports by the Author and Hermann B. Gessner, M. D., School of Medicine, Tulane University of Louisiana, New Orleans.

The object of this communication is to review some of the most recent suggestions which have been offered for the relief elephantiasis and elephantoid states dependent upon chronic obstructions of the lymphatic and venous channels, and to supplement this discussion with our personal experience in two recent cases operated upon by the method of Kondoleon, of Athens, Greece.

At the outset of this discussion, we should endeavor to clarify our ideas of what is meant by elephantiasis and the elephantoid states.

By elephantiasis we mean a progressive histo-pathologic state or condition which is characterized by a chronic inflammatory fibromatosis or hypertrophy of the hypodermal and dermal connective tissue which is preceded by and associated with lymphatic and venous stasis, and may be caused by any obstruction or mechanical interference with the return flow of the lymphatic and venous currents in the affected parts. In order to bring about the hypertrophy of the connective tissue, which is the distinctive feature of the true elephantiasic state, the mechanical impediment to the lymphatic and venous drainage of the part is not sufficient, because a simple mechanical obstacle, while causing a regional or localized dropsy or lymphedema, will not bring about the characteristic fibromatosis and other histologic changes which are peculiar to elephantiasis. As Unna, Darier and many others have well shown, a simple mechanical edema is incapable of exciting a prolifera-

*Received for publication May 16, 1913.

Digitized by Google

tion of the collagenous connective tissue. We know by clinical observation that edema may exist many years in the extremities and other parts without causing any fibromatosis or hyperplasia of the connective tissue of the parts. Something more than lymph stasis is required, and that something is infection with pathogenic organisms, and especially those of the streptococcal type which find a favorable soil for development in the stagnant lymph stream. The histopathological elements which are essential to complete the picture of elephantiasis are: (1) a mechanical obstruction or blockade of the veins and lymphatics of the region, usually an obliterative thrombo-phlebitis or lymphangitis or adenitis; (2) hyperplasia of the collagenous connective tissue of the hypoderm; (3) gradual disappearance of the elastic fibres of the skin; (4) the existence of a coagulable dropsy or hard lymph edema; and, (5) a chronic reticular lymphangitis caused by secondary and repeated invasion of pathogenic micro-organisms of the streptococcal type.

If we adopt this conception of the histologic process which underlies the pathology of elephantiasis as it is recognized in its endemic tropical types, as well as in the sporadic cases, which may occur in all climates, we can readily appreciate that the histologic process is of a generic character, though it may by initiated by many specific causes,—the underlying histologic background remaining, however, always the same. In this manner, we can easily reconcile the many conflicting views relative to the pathology of elephantiasis. The long established duality of classification of the disease into the classic *Elephantiasis tropicum,* which is usually attributed to the presence of *Filaria nocturna,* or the strictly parasitic type of the disease, and the *Elephantiasis nostras streptogenes,* which prevails in all climates, no longer suggests distinct and specific types of the disease These are histologically alike as morbid processes, and only differ in the primary cause of the lymphatic and venous obstruction which initiates the process. Therefore, while nosologists classify elephantiasis into the previously mentioned groups, it is evident that the elephantiasic process is always one and the same; always maintaining similarity of histologic type

Digitized by Google

regardless of the multitude of causes that may bring it into existence. The one etiologic factor which seems to be inseparable and essential to its pathogeny is infection—frequently repeated—which bring about permanent alterations in the vasculo-lymphatic apparatus of the skin and its underlying connective tissue. The reason why elephantiasis, as a clinical entity, is so much more frequent in the tropics than elsewhere, is because the conditions which predispose to and favor cutaneous infection as well as lymphatic obstruction, are so much more frequent there than in colder climates; greater exposure of skin areas, especially the lower extremities, to traumatisms of all sorts; greater activity and, consequently, greater irritability of the skin; universal presence of suctorial insects and gross parasites; and greater frequency of eruptive diseases, etc., all of which tend to open wide the portals of infection. It is now pretty well admitted that filariasis is only one of the causes that initiate the elephantiasic process even in the tropics. Certainly, the filaria are not so frequent a cause of the disease as was formerly believed. The incidence of filariasis is not coincident with that of elephantiasis. For instance, Creighton Wellman, (Journal of Trop. Med. 1908, p. 118), while stationed as health officer at the Portuguese Colony of Angola, in West Africa, had many opportunities for investigating the relationship between filarial disease and elephantiasis and in a careful study of fifty cases he never found any evidence of embryo filariæ in the blood, or for that matter, in the blood of five hundred individuals in that colony, whom he examined for evidence of filarial disease. Le Dantec had a similar experience in French Guiana, where elephantiasis is common and filariasis very rare. Prout, in Sierra Leone (1908), observed a great many cases of filariasis in that colony, but met with a similar experience in the Congo, where filariasis is almost a universal disease. Sir Patrick Manson, who immortalized himself by his researches into the mode of propagation of filarial disease through the agency of the mosquito, and was the first to establish the relations of filariasis to elephantiasis, has modified his earlier views on the relationship of filarial parasitism to elephantiasis. In his work on Tropical Diseases (1907) he now teaches that the mechanical

Digitized by Google

obstruction of the lymphatics caused by *Filaria bancrofti* is not alone sufficient to cause elephantiasis, and that a secondary microbial infection of the obstructed area is necessary to cause the tissue changes of elephantiasis. This same observer writes:

> "Lymphatic stasis, by itself, does not cause elephantiasis. The obstruction may cause lymph edema, but not a true hypertrophy of the edematous tissues. If an inflammation (infection) is acquired in a closed area of lymphatic congestion, an event which may result as a consequence of the slightest traumatism, elephantiasis will then develop."

According to Low, if a lymphatic obstruction caused by adult filariæ is followed by an attack of erysipelas, the filarial embryos are killed and their disorganization is a cause of the lymphangitis which culminates in elephantiasis. Clinical observation also abundantly shows that if a lymph scrotum develops as a consequence of filarial obstruction, it will remain a plain lymph scrotum for an indefinite period of time, and will only become an elephantiasic scrotum when repeated attacks of erysipelatous infection follow in the wake of the mechanical stasis and in this way starts the fibromatous process which is the histologic essential of elephantiasis. The burden of this discussion is merely to show that even in tropical climates where filariasis prevails endemically, elephantiasis is a diseased state not subject to one cause, but to many, and, in fact, to any agency that may obstruct the lymph stream provided dermal infection follows in the wake of lymph stasis. We have now come to realize that whatever the cause of the lymph edema may be, the element of infection is the one essential and determining factor in the production of true elephantiasis. In fact, if we accept the views of many writers, such as LeDantec, Sabouraud and Unna, the progressive fibromatosis which we recognize as *Elephantiasis nostras,* may occur independently of any stagnatory state of the lymphatic or venous circulation, and solely as a result of repeated attacks of a streptococcal infection, which has been regarded by many as identical with the erysipelas coccus of Fehleisen. Moreover, the streptococcal infection of elephantiasis presents all the characteristics of the classical cutaneous erysipelas, with the exception that in elephantiasis it is usually

Digitized by Google

limited to one particular region in the lower extremity, the eruption rarely extending beyond the groin. It is rarely ambulatory or migratory as is the case with the well-defined type of erysipelas.

This association of a streptococcal infection of the erysipelatous type is, we repeat, almost an inseparable and constant feature of elephantiasis, no matter what the original predisposing cause may be. It is also this association of the erysipelatous attacks, with the progressive hyperplasia of the dermal and hypodermal connective tissue of the affected region, that distinguishes true elephantiasis from the elephantoid states. Sabouraud, who has given much attention to the bacteriology of elephantiasis, Unna, LeDantec, Bockhart, and others, agree that the microorganism is a distinct *Streptococcus* which cannot be morphologically distinguished from the Fehleisen coccus of erysipelas. LeDantec describes in addition a special coccus which he designates as the lympho-coccus; Renon found the pneumococcus. But there is no question that from the clinical point of view, the recurrent streptococcal infection which is peculiar to elephantiasis is similar to that of erysipelas. In the many cases that have come under our observation, the history of repeated attacks of erysipelas has been invariably connected by the patient with the origin and evolution of the disease. Sir Joseph Fayrer applied the term elephantiasic fever to the febrile manifestations which accompany the appearance of the local erysipelatous rash. The fever is usually ushered in by a chill or rigors, and the temperature rises to 103° or 105° F. and is followed by remissions and profuse sweats. The fever usually lasts from two to eight days and defervesces with the subsidence of the erysipelas, which rarely extends beyond the root of the limb. During the attack, the skin of the affected region becomes red, painful, swollen, and looks exactly like the erysipelas rash; the lymph nodes are enlarged and the redness diffuses itself with great rapidity over the entire surface of the limb. After the subsidence of the attack, the skin remains swollen, giving the impression of a soft, doughy edema. The soft consistency gives place to a more permanent hardness, the skin of the affected part never returning to normal. The underlying soft parts unite

Digitized by Google

with the skin, which increases very much in thickness, forming a firm, immovable mass of tissue which continues to grow until it finally assumes a monstruous size (Elephant's foot, Barbadoes leg, etc.) which is characteristic of the disease.

The development of elephantiasis by inoculation of pure erysipelous cultures was experimentally tested by Bockhart, Sabouraud, LeDantec and others. In accounting for the repeated or recurrent attacks of this streptococcal infection, Unna (Histopathology of the Skin, Walker's translation, p. 493) states:

"That it is in the highest degree probable that the true sporadic cases of elephantiasis develop from incompletely healed erysipelas—that is, those which leave behind disturbances in the circulation. The streptococci remain latent in the tissues and in this way excite the chronic proliferative tissue changes which we subsequently recognize as elephantiasis. At first the attacks of erysipelas occur at long intervals, perhaps twice or three times a year, then once a month, rarely oftener. Each time the limb grows larger until in the course of time a distinct elephantiasic state is established. Natural immunity does not appear to be easily acquired; and once the erysipelatous habit, so-called, is acquired, it usually becomes a permanent feature of the disease, though in some cases the attacks become milder and disappear altogether, but not until the elephantiasic state is fully established."

In this connection, I recall the case of a lady who came on a visit from Washington to New Orleans nearly ten years ago, and who sent for me during one of these attacks. She did not have a typical Barbadoes leg, but her left lower extremity was very much larger than the right, causing the limb to appear gigantic and deformed. Within a few days the erysipelatous attack subsided, and with the hope of preventing further attacks, I suggested a systematic course of treatment with polyvalent antistreptococcic serum to be injected in doses of 10 c. c. at least three times weekly, hoping that the polyvalence of the serum might in some way antagonize the peculiar streptococcus of this disease. She subsequently wrote me that after sixteen injections she had enjoyed a long interval of peace. Following another attack, her medical adviser at home gave her a series of sixteen injections, after which the attacks diminished in frequency and became much milder. When the attacks occur now, they are abortive, the temperature seldom rises above nor-

Digitized by Google

mal, and there is no increase in the swelling. The disease has been attenuated markedly since the institution of the anti-streptococcal treatment, and so great was her confidence in ultimate recovery that she married.*

We have now endeavored to define what elephantiasis is and we have laid stress upon the streptococcal or erysipelatous infection which accompanies it because this has a distinct bearing upon the therapeutics of this condition,—a bearing which cannot be overlooked when surgical measures are contemplated for its relief.

In distinguishing the elephantoid conditions from those which are truly elephantiasic, it will be opportune to note the fact that the filarial or strictly tropical type of elephantiasis is practically unknown in Louisiana or on the Mexican Gulf coast and in the South Atlantic States. Only occasionally are, in these regions, seen manifestations of filariasis such as chylocele and chyluria, but not the typical lymphatic elephantiasis which is so peculiar to other countries and especially the East Indies. *Filaria immitis,* or dog filaria, is extremely common in the canine species of the South, but the human filaria is very rare and, as a rule, imported from the West Indies and Central American countries. Even in these tropical latitudes, where elephantiasis is common (Barbadoes leg), its association with filariasis is not as frequent as one would suppose. None of the observers in Charleston or Mobile, where the first observations on American filariasis were made known by John Guiteras, DeSaussure, William Mastin, and others, refer, to my knowledge, at least, to the elephantiasic type of filarial parasitism. We have unusual opportunities for the observation of tropical and semi-tropical diseases in New Orleans, and now that a school of Tropical Medicine and Hygiene has been well established in connection with Tulane University, under the leadership of so accomplished and keen an observer as Creighton Wellman, we are always on the lookout for parasitic elephantiasis. We have, however, our share of non-parasitic elephantiasis—the true so-called *Elephantiasis nostras streptogenes,* both among the negroes and the whites,

*See remarks by the author in the proceedings of the S. S. & G. Ass. in the discussion of Dr. Vander Veer's paper on elephantiasis at the Washington meeting, December, 1911, vol. xxiv.

Digitized by Google

and characterized by association with the erysipelatous attacks previously described. But the majority of cases that come under our observation are elephantoid states, swollen limbs, and genitals, following chronic lymph edemas of the dependent parts in which venous and lymphatic obstruction plays the leading rôle in the pathogeny. The starting point of these obstructions may be traced to injuries involving the circumference of the limbs at their root, or tumors blocking the deep lymphatics; chronic circular ulcers of the leg, syphilitic, tuberculous and phagedenic in origin; chronic phlebitis associated with varices, post typhoidal, puerperal; chronic eczema and kindred conditions. In the upper extremity the arm and the hand are often seen swollen, brawny with chronic lymph edema in women who have neglected cancer of the breast, which has spread to the axilla, or who have undergone the so-called radical treatment for cancer of the breast and whose axillary vessels have been compressed by cicatricial contraction or by secondary neoplastic metastasis. These elephantoid states constitute an extremely unsightly, painful and disabling deformity which in the lower extremities, especially, restricts the patient to a sedentary life. These patients usually appeal to us for relief, but only too often the means of relief at our command yield far from satisfactory results.

The non-surgical treatment, consisting of elevation of the limb, compression with elastic and other bandages, electric applications, hydrotherapy, including active hyperemia in hot air cabinet combined with massage, compresses saturated with magnesium sulphate (Fischer), yield effective results only in recent and mild cases in which edema is the chief cause of swelling. The injecctions of fibrolysin recommended by Castellani, of Ceylon, for the fibromatosis of elephantiasis, have occasionally yielded satisfactory results; and recently, Kuttner (quoted by LeNormant), succeeded in curing by this means an elephantiasis of the scrotum which had relapsed after several operations. Fibrolysin should be remembered as an adjunct in the treatment of these cases, but judging by our experience with this drug in other fibromatous and sclerogenic states, we are not inclined to lay great stress upon its value. The possi-

Digitized by Google

bilities of repeated injections of anti-streptococcal polyvalent serum in cases of an elephantiasis, specially in the early stages, as successfully resorted to in one of our cases, is worthy of mention; and possibly, a vaccine made from autogenic cultures obtained from the fluids of the limbs, during the erysipelatous attacks, might prove effective in at least checking the further progress of the disease. In view of the unreliability of medication and the untried possibilities of specific vaccines, it is not surprising that the thoughts of the practitioner should have been directed long ago to relief through the mediation of surgery.

It is evident that in the extensive cases in which the affected parts have attained monstrous size, nothing affords relief save amputation. In other cases, also of an advanced and aggravated character, which are marked by large areas of dense sclerosis with diffused verrucose transformations of the skin and excrescences, resting on a more or less circumscribed fibroid base (sclerotic or hard elephantiasis), in others associated with vascular ectasis involving arteries, veins and lymphatics, *Elephantiasis telangiectodes*), again, those with large ampullar dilatations of the lymphatic network (*Elephantiasis lymphangiectodes*), —it is possible, sometimes, to preserve the limb by large conservative decortications and excisions of the affected skin, and of the fibromatous hypoderm. These conservative operations have undoubtedly proved successful in many cases in the hands of surgeons practising in tropical latitudes, but decortication and excision are of restricted application and have been limited practically to elephantiasis as it affects the generative organs, penis, and scrotum; labia, vulva. It is a method that is scarcely applicable on a large scale to the extremities, at least as a typical procedure, when the entire limb is involved. Hence, the gradual evolution of other methods.

* * * * * * * * * * *

The oldest, and now almost forgotten, method of surgical treatment was that proposed by Carnochan in 1851, and later by Morton, in this country, subsequently resurrected by Hueter in 1898, who advised the ligation of the main artery of the limb, the femoral or external iliac, with the view of restrictly

Digitized by Google

the circulation and thereby diminishing the tendency to lymph dropsy and stasis. But apart from the danger of gangrene inherent to the ligature itself, the records of this procedure as compiled by Leisrink and Rotter show no results to counterbalance the disasters which have attended its application in the many cases in which it has been tried. In more recent times, Kuznetzoff (1905), Miculicz, Von Eiselsberg, Kaposi and others have tried the effect of multiple cuneiform excisions of the diseased skin and of the underlying fibromatous tissue. This is the method of decortication limited to certain more or less extensive areas of the affected territories. The results have been favorable in a certain number of reported cases; the patients having been, in many instances, appreciably benefited, if not completely cured (Rosanow).

In recent years, the surgical treatment of elephantiasic states has assumed an entirely different direction, starting with the idea that lymphatic stasis is the essential element in the chronic or brawny edema of the extremities. Sampson Handley, in 1908, proposed that the obstructed areas should be drained into the adjoining healthy tissues, which could absorb the fluids poured into them from the flooded districts. This, of course, applies to the cases in which little tissue proliferation has occurred and in which lymphedema alone plays the greater part in the formation of the swelling. If, in such cases, it were possible to establish a permanent and effective system of drainage, the swelling would be greatly diminished, if not altogether removed.

To accomplish this end, Handley ingeniously suggested new capillary lymphatic pathways by inserting long threads of unabsorbable silk which tunnelled the border line between the edematous and the normal tissues. This procedure he described as lymphangioplasty. He placed a number of silk threads (four or five) in the subcutaneous cellular tissue of the affected limb, throughout its length (from the wrist to the chest wall in the upper extremity; from the dorsum of the foot to the abdominal wall in the iliac region, in the lower extremity), allowing these to remain buried in the subcutaneous edematous tissue indefinitely. Handley began by applying his method to the upper extremity in cases of brawny edema of the arm following axillary

Digitized by Google

metastasis or operation on the breast for carcinoma. He was able to note marked diminution and even complete disappearance of the edema and a cessation of the pain. He then treated in a similar way an elephantiasis of the lower extremity, but the threads became infected and had to be removed. The edema had considerably subsided, then promptly returned. After this Lexer (Jena), (quoted by Rosanow and Guibé) applied Handley's lymphangioplasty to two cases of elephantiasis of the leg following repeated attacks of erysipelas in one and varicose ulcer in the other. He obtained a very remarkable operative success. The circumference of the limb diminished 12 c. m. in one and 31 c. m. in the other.

Again, Mitchell obtained with Handley's method an appreciable improvement in two cases of hard edema of the face following recent attacks of erysipelas.*

Since 1910, other cases of lymphangioplasty have been published, but with less brilliant results. Shoemaker (proceedings Surgical Society of the Netherlands, 1910, quoted by LeNormant) intervened in the case of a patient suffering with an elephantiasis of the lower extremity which had resisted all treatment. He placed 4 silk threads all the way under the skin from the ankle to the groin; following this operation the circumference of the limb was reduced one-third. Bylin-Kolosowski, of St. Petersburg (Russk. Vratch., 1912, quoted by Rosanow) reported two cases of angioplasty for elephantiasis of the lower extremity. The results were satisfactory, though some of the threads were eliminated in one of the cases. The size of the limb diminished, the pains disappeared, a varicose eczema and ulcer were cured, and walking again became possible. Beketow, in Ziedler's clinic (St. Petersburg), also obtained a satisfactory result in a similar case.

On the other hand, Goebel (Surgical Society of Breslau, 1910), only obtained an indifferent result in a case of elephantoid edema of the lower extremity of the lower limb of eczematous origin, and a complete failure in several cases of edema of the arm following carcinoma of the breast. (LeNormant.)

†Guibé Loc. Cit.

Digitized by Google

I had occasion to exhibit at one of my clinics, at the Charity Hospital (December, 1911), a young man, aged 27, who had sustained a fracture of the malar bone. After the subsidence of the ecchymosis and extravasation which involved the entire left half of the face, a circumscribed area of permanent edema which involved the lower lid and the subaponeurotic tissues remained as a permanent swelling. The edema was very well defined by a furrow which completely separated the edematous area from the normal tissues. The whole lid stood out permanently as a hard semi-elastic baggy swelling which did not yield on pressure but could be moulded slightly by the fingers. Massage and hot applications had been applied, but to no avail—the swelling persisted, causing not only a marked disfigurement, but a considerable inconvenience by narrowing the interpalpebral fissure. It was evidently an area of hard lymph edema. It was a good opportunity to try the merits of Handley's lymphangioplasty and this was done without serious difficulty under local novocain-adrenalin anesthesia. In order to avoid excessive scarring, a semi-circular incision was made following the lower contour of the swelling, and a deep gutter was made with the level of the lower border of the lip. In this trough, four heavy silk ligatures were imbedded; the end of each resting under the swollen lid, well in the orbital margin. The four terminal ends were carried subcutaneously in radiating directions in the connective tissue planes under the facial muscles with a long Reverdin needle. One thread was cut short on a level with the *Alae nasi*, another below the angle of the mouth; another below the malar eminence, and the last, below the border of the jaw under the crossing of the facial artery. These threads were all cut on a level with the skin as they were extracted with the needle. By pulling on the threads as they were held inside of the incision, they disappeared from the surface and were completely buried in the tissues. The single wound which remained was readily closed by a few interrupted superficial sutures. Ten days after the operation, the edema had subsided sufficiently to permit the patient to open his eyes well, and the baggy deformity was only slightly perceptible.

The patient was discharged from the hospital about this time

Digitized by Google

and has never been heard from. The question that arises is: Did Handley's operation relieve the edema or would this have subsided spontaneously after the free dissection of the lid that was made at the time, or has the swelling relapsed? These are questions that cannot be answered. As more than a year has elapsed since the patient has left the hospital, we are inclined to believe that if the swelling had returned, the patient would have come back for further advice.

In the light of subsequent experience and the experimental investigations which are conducted at the Kasr-al-Ainy Hospital by Madden, Ibrahim, and Ferguson, of the Egyptian Government School of Medicine, at Cairo, and reported by these workers in a very valuable paper, which appeared in the British Medical Journal of November 2, 1912 (pp. 1212-1214), we do not feel as optimistic as we once did in regard to the efficiency of Handley's very ingenious and, at one time, promising procedure. In fact, Mr. Handley, himself, in his summary of the results of the operation (Hunterian Lectures on the Surgery of the Lymphatic System, British Medical Journal, April 9, 1910), admits very candidly that "to my mind lymphangioplasty has failed to establish its position in the treatment of elephantiasis." And again, "it would appear that in the lower extremity, as contrasted with the arm for instance, the strenuous opposition of gravity nullifies the effects of the operation as soon as the limb is allowed to hang down for even a short period daily. The operation does, indeed, supply the channels which are missing; but, as I have already indicated, it does not provide a motive force. It is unable to fight against the full vertical pressure of gravity in the lower limb." But Madden, Ibrahim and Ferguson go further and furnish evidence to prove that it is not only gravity that militates against the success of the operation, but other histological causes which destroy all its value even as a palliative procedure.

They state: "While our clinical finding in and around threads taken from the limbs two or three weeks after lymphangioplasty, and in others experimentally introduced into the subcutaneous tissues of guinea pigs, appear to show that quite apart from the action of gravity, the artificial lymph channels do not

Digitized by Google

persist for any length of time, and that there is finally an obstruction to lymph return from the obliteration of the lymphatics in the neighborhood of the inserted thread."

These observers report eight cases of elephantiasis of the lower extremity, of which only one was associated with filariasis; in all, Handley's technic was followed rigorously and with apparent success as far as the immediate results of the operation were concerned; but, in all the cases, with the exception of the last, which was very atypical and limited to the thigh, relapse promptly occurred when the patients left their beds and returned to their occupations. In addition to the clinical observations, they made careful studies of the tissues, including the buried threads in the elephantiasic patients themselves, and also studied the tissues after experimental lymphangioplasty in healthy guinea pigs. They conclude their very instructive report as follows:

"(1) Clinically, it is abundantly evident that lymphangioplasty fails to effect anything but a very temporary improvement in elephantiasis of the legs. The swelling is very markedly reduced within 48 hours after the operation; but the improvement continues only so long as the recumbent position is maintained. Within, at most, 21 days after the operation, or as soon as the patient begins to walk, the swelling invariably returns and no permanent improvement results." (2) The examination of the tissues surrounding the threads introduced during the operation of lymphangioplasty in cases of elephantiasis, and also around threads introduced into healthy tissues of normal guinea pigs, supplies adequate reasons for the failure of the operation. Important as the action of gravity may be in contributing to the failure to maintain a new artificial lymphatic circulation, it appears that this want of success is, in far greater degree, due to definite reactive changes in the tissues immediately around the thread which soon isolate the new lymph tube from the surrounding lymphatic areas and continue until they completely obliterate it. (3) For a short time the threads, by virtue of their capillary action, drain the surrounding tissue of the lymph contained in them. (4) The threads in the tissues soon excite a definite cellular reaction which in 14 to 21 days leads to the

Digitized by Google

formation of a dense and progressively contracting fibrous tissue. These fibrous changes, occurring arounds the ends of the threads as well as along its whole length, completely isolate it, and it may then perhaps be compared to a long wire lying within an impenetrable sheath. (5) The thread itself is later penetrated by a mass of cells running along its fibres, which must eventually lead to its complete disintegration, and the formation of a solid column of a dense fibrous tissue along which no absorption of fluid of any kind can possibly occur."

These conclusions, discouraging as they are, are in harmony with sound pathology and appear to be incontrovertible. The failure of lymphangioplasty in the lower limbs applies as well in the upper extremity or wherever the threads may be used in the creation of artificial lymph channels. The conclusions arrived at by the Egyptian observers is a death blow to a procedure which was promising in its simplicity, and fascinating to all those who, disregarding the fundamentals of a sound pathology, still hoped that its clinical applications would demonstrate its value as a remedy for a most formidable and deplorable condition.

But even before the accumulated evidence of the clinic and the laboratory had discredited lymphangioplasty as a remedy for lymph stasis, and elephantiasis, other surgeons had thought of draining the obstructed lymphatic areas—by other methods which, without leaving a foreign body in the wound to set up reactionary tissue changes, would open up new avenues for the lymphatic circulation by establishing a communication between the superficial and the deep planes of the lymphatic stream and thus providing an exit for the pent up fluids. The deep aponeuroses which envelop the extremities and other parts of the body with a resisting sheath, constitute an almost impenetrable barrier which seperates the superficial from the deep lymphatic and venous circuits.

This is true to a great extent in the normal state, but is much more apparent in the altered conditions which we find in elephantiasis. By suppressing this barrier, the course of the stagnant lymph may be advantageously directed towards the deep muscles and intermuscular lymph channels. Now, as LeNormant

Digitized by Google

remarks, it is a constant fact that in the elephantiasic states, no matter how ancient or aggravated they may be, the tissue lesions are limited by the derm and hypoderm, and do not extend below the aponeurosis. The infraaponeurotic tissues remain immune and preserve their normal circulation undisturbed.

There are, therefore, on a level with the blocked areas, healthy, circulating tissues which are capable of absorbing the stagnant superficial lymph, provided some means of communication is established between them.

LANZ'S OPERATION.—These ideas prompted Lanz of Amsterdam to try a plan of drainage or "deep lymphatic derivation," which he put into execution in 1906. His first case was that of a man aged 40 years, who presented an elephantiasis, of the lower extremity, of unknown origin. The disease had existed for over four years and had extended up to the trochanter. After keeping the limb in an elevated position for some time, the affected limb was still 8 c. m. larger than the normal one. Lanz then operated as follows: He made a longitudinal incision through the skin and fascia lata throughout the length of the external aspect of the thigh, penetrating along the posterior border of the vastus externus down to the femur. He then detached the periosteum and opened (trephined) the medullary canal in three places: First, on a level with the lower, middle and upper thirds respectively. He then cut a number of pediculated strips out of the fascia lata, which were inserted and attached to the openings in the marrow canal previously made.

In addition thereto he made a number of short incisions in the aponeurosis, hoping that the hypodermal lymph would thereby its way into the infraaponeurotic connective tissue of the skin. Following this he sutured the long incision in the fascia and in the skin. The results of this intervention were excellent and three years later the cure of the patient was almost complete. The patient resumed work and at the close of the day's labor, no notable differences were observed between the two extremities. By careful measurement, it was found that the affected limb was still larger by 1 to 3 c. m. at different levels; and, the skin was thicker and less supple than on the well side.

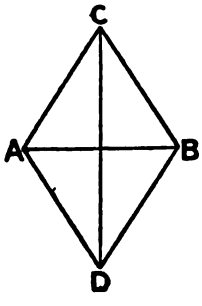
However, Lanz's operation was, from the technical point of view, quite complicated. The author of this procedure, himself, believed that the trephining of the femur was unnecessary and could be dispensed with. As a matter of fact, all surgeons who have practiced or modified his operation have satisfied themselves with a simple incision of the fascia and an opening made through this to the deep intermuscular planes without disturbing the bone.

Digitized by Google

In a case of hard edema, following an injury, Kondoleon, of Athens, Greece, whose additional writings will be referred to later, adopted the principles of the Lanz operation, cut strips out of the fascia which he implanted among the muscles. In addition, he left wide open the ends of the longitudinal incisions which he had made throughout the length of the facia lata in order to establish a free communication between the superficial and deep lymphatic planes. His patient remained apparently cured one year after the operation.

OPPEL'S MODIFICATION.—Oppel, of St. Petersburg, in a case of elephantiasis of the lower extremity, modified Lanz's procedure in at least three ways: While Lanz restricted his intervention to the thigh, Oppel operated successively upon the thigh and leg. In each of these regions he incised the aponeurosis throughout its length. Then, cutting a large pediculated flap of the thickened edematous hypodermal tissue, he inserted this between the edges of the divided aponeurosis and carried the flap down into the subaponeurotic muscles, where it was fixed permanently with interrupted sutures. Finally, he omitted Lanz's trephining of the bone. (Rosanow.)

ROSANOW'S OPERATION.—Adopting an analogous procedure in which he carried out the implantation of the thickened elephantiasic connective tissue, Rosanow of Moscow operated upon a man aged 48 years, who was the subject of elephantiasis of the lower limb. The disease had existed four years and the circumference of the thigh was 20 c. m. greater than that of the sound limb. In this case, the usual history of recurrent attacks of erysipelas was missing. The Wasserman test was negative and the leucocyte count was moderate. The origin and nature of this elephantiasis remained obscure. All the methods of treatment to reduce the enlargement had failed. Rosanow performed the following operation: He attacked both the thigh and the leg. On each one of these segments of the limb, he cut a cutaneous rhomboidal or lozenge-shaped flap, the long axis of which corresponded to the entire length of the thigh and of the leg, the transverse axis measuring 15 c. m. in the thigh and 11 c. m. in the leg. He was careful, in both regions, to excise only the skin, leaving the subcutaneous tissue intact. Following the short diameter of the rhomboid (A-B) he made a deep incision which included the subcutaneous connective tissue and underlying aponeurosis. He established in this way two triangles (A-B-C and A-B-D) which are in apposition at their bases. An other deep incision was carried along the borders of each one of these triangles (A-D and C-B). Each one



Digitized by Google

of the celluloaponeurotic flaps thus liberated, was turned and tucked in between the underlying muscles; the vastus externus in the thigh, the gastrocnemius in the leg. When this was done, the cutaneous wound was closed in its longitudinal axis.

Two months and a half after this intervention, the circumference of the affected thigh has diminished from 6 to 6.5 c. m. and of the leg from 15 to 17 c. m. The movements of the limb had decidedly improved at the end of 7 months, the improvement continued, and the patient was able to resume his usual occupations. It would appear that in this case, the operation had effected more than a simple diminution in the edema. By comparing the histologic examination of the diseased skin removed at the first operation and of other specimens obtained two months after, a marked involution or retrocession was demonstrable in the fibromatous hyperplasia of the derm. In the specimens examined two months after the operation, it was found that the thickness of the epithelium had increased, that the papillæ were better outlined, that the corium was less thick, there was hyaline degeneration, and the small veins and lymphatic capillaries which had been strangled and obliterated by the sclerotic process had again become visible and permeable.

KONDOLEON'S OPERATION.—In two recent articles, Kondoleon continues to support the favorable impressions of his first experience which was published in the Münchener medizinische Wochenshrift of March 5th, 1912. In these later contributions, he still further simplifies the procedure which he originally adopted on the principles underlying the Lanz technic. In his latest practice he insists on the free excision of the fascia lata in the thigh and leg by removing large sections of aponeurosis. He believes that in this way new anastomotic channels will be created between the supra and the infra aponeurotic lymph spaces in a permanent way, and the several cases of elephantiasis which he has treated in Athens by this method, certainly appear to support his contention. The simple longitudinal incision of the aponeurosis recommended by Lanz will do well enough in incipient or mild cases; on the other hand, they are ineffective and are followed by relapse in the chronic and aggravated cases. In these, according to Kondoleon, the fibromatosis also involves the fascia itself. He lays stress upon the changes which occur in the fascia. The fascia becomes thicker; sometimes it is 2 or 3 m. m. thick; it is infiltrated and adherent; it loses its normal aspect and assumes a grayish-white color. The microscope reveals a disassociation of the fibrous layers by combined edema and

Digitized by Google

cellular proliferation. A simple incision in such cases will not suffice. Kondoleon satisfied himself on this point when operating for the second time on patients who had relapsed after the first operation. He found that the invision which he had made in the fascia had been entirely closed by cicatricial tissue. In consequence thereof, he argues that it is necessary to excise large sections of the fascia in the segments of the limb involved, if a cure is to be obtained.

Kondoleon, therefore, makes two longitudinal incisions, corresponding to the length of the thigh and leg on each of the lateral aspects of the limb; he then retracts the edges of the incision, exposing a broad area of the subcutaneous elephantiasic tissue and denudes the aponeurosis. This is now cut out for a length corresponding to the cutaneous incision and to the extent of three or four fingers in breadth. In this way, when both sides of the limb are included, nearly half of the fascia enveloping the limb is excised. The gap is allowed to remain open, exposing the underlying muscles, which remain in contact with the skin which is sutured over them. Kondoleon has operated by this method upon 6 cases of elephantiasis of the lower extremity: 2 were due to long-standing suppuration of the foot; 1 followed a white swelling of the knee with infection of the popliteal space; 1 an atypical elephantiasis caused by repeated attacks of erysipelas; another was a sequel to an extirpation of the lymph nodes of the groin, and in the last, the origin of the disease was unknown. Some of these cases had bene elephantiasic thirty to thirty-five years, and had relapsed after other operations. In all these patients, the results appeared to be very satisfactory; the edema had disappeared, the circumference of the limb had diminished 5.7, 10 and 19 c. m. respectively. The skin had regained its elasticity and normal mobility. The weakness of Kondoleon's report lies in the fact that the period of observation following the operation is too short (two months the longest) to justify final conclusions, no matter how encouraging the immediate post-operative results may appear to be. It is well to add as a further caution, that the results appear to be less satisfactory in cases of the brawny arm or lymph edema of the upper extremity, caused by a spreading cancer of the breast. Kondoleon applied his method to a patient of this class and obtained a diminution of the edema, but the pain and numbness of the arm remained unchanged.

Clinical Reports: Dr. Matas.

Mrs. W. B. J., American, residing in Alabama, wife of a physician, aet 46. She is the mother of several children, all grown and healthy. Her family antecedents are negative, from a hereditary point of view. Her father died from an accidental cause at the age of 42. Her mother is living and in good health. She has 5 sisters and 1 brother, all living and healthy. Her personal history shows that, apart from the infantile

Digitized by Google

diseases, measles, mumps, whooping cough, chicken pox, etc., which she contracted in early childhood, she enjoyed good health until fourteen years ago (before her present illness developed), when she contracted typhoid fever of a very severe type, complicated with a phlebitis of the right lower extremity, which greatly retarded her convalescence. This typhoidal phlebitis was the starting point of her present trouble, for which she consulted me on October 17, 1912.

She stated that she never fully recovered from the swelling of the right lower extremity caused by the typhoidal phlebitis. The leg and thigh always remained swollen, painful and tender. The superficial veins of the saphenous groups were prominent, palpable, thick and tender. This led to considerable disability in locomotion, chiefly on account of the pain and swelling in the limb, especially on standing and after exertion.

Six years before consulting me, she had sought relief in an operation for supposed varicose veins, when a Schede operation, with a circular section below the knee, was performed by a distinguished surgeon in her state. The operation was not followed by any appreciable improvement and rather increased the swelling and disability.

It is interesting to note that four years after her recovery from typhoid, the affected limb was attacked by erysipelas, which ran an acute course, with rigors and high fever, but was limited to the right lower extremity. Since the Schede operation, she has had two severe attacks of erysipelas, always appearing in the same limb, which became permanently larger with each one of these attacks. These have always started without apparent cause in the same limb and have been limited to this extremity, the rash never extending beyond the right groin. The rash begins in the right foot or on the leg, and rapidly ascends upwards toward the groin. The attack usually lasts about a week, and begins with rigors and high temperature. She has had three of these attacks, the last only a few months before consulting me.

At the time of the consultation, the disease had practically existed fourteen years and the appearance of the affected limb was striking and characteristic of the elephantiasic state. Both lower limbs are stout and well padded with adipose tissue. The right limb shows an increase in the circumference of the thigh, fully three to five inches greater than at the corresponding levels on the opposite side. The same differences are shown in the leg which has assumed a cylindrical and barrel shape from the knee to the ankle. The foot below the ankle is normal, showing very little difference by comparison with the opposite foot. On the affected side, the skin is thick, tense and hard, suggesting a very firm, almost translucent adiposis. There is little mobility of the skin over the underlying connective tissue, but there is no pachydermia or sclerotic change in the skin itself. The branches of the internal and external saphenous veins are recognizable as bluish tracings like marbling of the skin, with little palpable or marked vari-

Digitized by Google

cosity. There is no pitting on pressure, no edema, no redness, nothing notable except the deformity caused by a lack of symmetry, loss of proportion and great increase in the size of the limb. The swelling gives the impression of a soft, semi-elastic, and yet firm adipose padding, or hard edema, which involves the subcutaneous tissues from the malleoli below to the leevl of the groin and of the trochanters above. There is little or no pain on pressure and the skin is normal, possibly whiter and paler than normal, without a sign of pigmentation, lividity or discoloration. The limb, as a whole, is so heavy that its increased weight, apart from the soreness and weakness in the muscles of the leg, is an impediment to long continued locomotion. The patient, as a result, has been compelled to lead a sedentary life. The great size of the limb at once suggests the picture of the soft, edematous stage of elephantiasis, but differs from this type in the absence of all swelling in the foot, which retains all its normal characteristics below the swelling, which stops abruptly on a level with the ankle. The lymph nodes of the groin are not enlarged.

In considering the chief facts in the clinical history of this patient, namely, the beginning of the swelling in a typhoidal phlebitis, which had left the limb in a state of hard edema for over 14 years; the history of repeated attacks of erysipelas, which aggravated the condition and increased the swelling with each subsequent attack; the further aggravation of the swelling after the circumferential division of the superficial veins in the Schede operation; and, the permanent hard swelling which gives the limb an atypical elephantoid appearance, I concluded that the patient was suffering from a chronic lymph edema which had had its origin in a permanent thrombotic obstruction of the veins and lymphatics of the limb.

OPERATION.—Bearing in mind the excellent results reported by Kondoleon in his last communication in the Zentralblatt für Chirurgie, July 27, 1912,‡ and believing that the underlying principles of his procedure were rational, I decided to resort to this surgeon's simple procedure in this case. The operation was performed on October 20, under ether anesthesia. A longitudinal incision was made on each side of the leg (inner and outer aspect) extending from the malleoli to the level of the condyles of the femur. The incision was carried at once to the aponeurotic planes through a very thick, dense layer of succulent cellulo-adipose tissue. The crural aponeuroses on both sides were found normal in appearance. The aponeurosis was then divided throughout the entire length of the cutaneous incision and the muscular planes exposed. The crural aponeurosis, though not thicker than normal, as Kondoleon describes it in the chronic form, shows a paler color than is usual. A strip of aponeurosis was then excised so as to expose the normal muscle tissue in the subaponeurotic areas. In order to establish

‡*Vide* Bibliography.

Digitized by Google

a direct continuity between the subaponeurotic and the supra-aponeurotic lymph spaces, not only was a strip of aponeurosis removed, but a broad, wedge-shaped section of the thick, densely infiltrated and edematous subcutaneous cellulo adipose layer was also excised throughout the length of the cutaneous incision. The removal of this large strip of subcutaneous tissue on each side of the leg at once reduced very markedly the whole circumference of the limb. To prevent the closure of the aponeurotic layer which separated the subcutaneous from the deep muscular lymph spaces, the edges of the aponeurosis were, after undermining them, folded upon themselves and sutured to the edges of the muscles to prevent their future coaptation, thus leaving a gap in the aponeurosis of over three fingers in breadth, which left the tibial and fibular muscle planes exposed for a corresponding length. In this way, the deep subaponeurotic lymph channels were made continuous with those of the subcutaneous space. On the fibular side, we followed more closely Kondoleon's original suggestion to excise a broad strip of the aponeurosis without attempting to suture or infold it. After seeing to all the bleeding points, which were more numerous in the subaponeurotic than in the subcutaneous areas where the veins appeared to be largely obliterated, the long wounds were closed by continued catgut sutures reinforced at various levels with a few interrupted silk worm sutures.

We originally intended following Kondoleon's example by cutting two parallel incisions into the thigh and up to the groin into the fascia lata on the inner and outer aspects of the thigh; but as the swelling in the thigh appeared to be much softer than in the leg, we determined to limit the procedure, as applied, to the leg and watch the effect on this part before proceeding further at this first sitting. After the usual sterile dressing, without drainage, the leg was put up in a posterior gutter splint which immobilized the knee and leg.

The post-operative history was practically uneventful. At the end of a week the first dressing was removed and the two lines of incision were found healed *per primam*. After bathing and gently massaging the limb, a lighter dressing was applied with the splint. This was removed after a few days, and permanently discontinued to allow the limb to be bathed every day in hot and cold baths, which were given with massage until the patient was discharged November 17, about three weeks after the operation.

Before her discharge, an elastic woven stocking was fitted to the limb. At the time of her departure, the reduction in the size of the limb was notable. The skin was softer, had regained its suppleness, nearly normal mobility, and the patient was able to walk with considerable ease.

It is now five months since the operation was performed, and the reports which we have received from the patient and her husband indicate that a marked improvement has been obtained. The improvement in the size, appearance and functional restoration of the limb is

Digitized by Google

so marked that the supplementary operation originally proposed for the thigh has not been deemed necessary, the enlargement in the thigh being also reduced with the diminution in the size of the leg, which, while not symmetrical with the limb on the normal side, is nevertheless much improved.

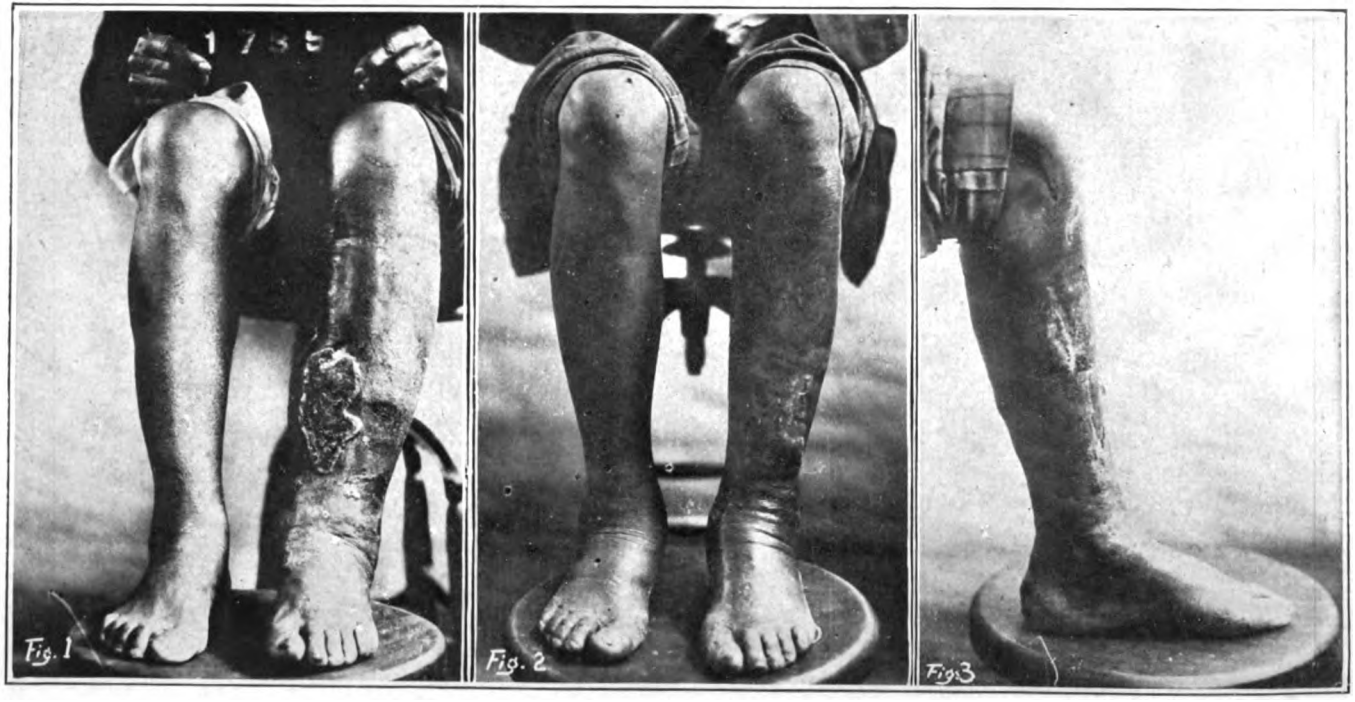
If we may judge by the results obtained at the end of a period of five months observation (April, 1913), we may fairly assume that Kondoleon's simple procedure is of decided palliative benefit in this particular class of cases.

Case of Dr. Hermann B. Gessner.

This patient was about to lose his limb by amputation when, at a meeting of the Touro Clinical Society, I heard Dr. Rudolph Matas report a case in which he had obtained a good result by applying the Kondoleon method. Securing from him the reference above given, I was struck by the simplicity of the method and determined to apply it. Eli J., colored, 56 years old, laborer by occupation, was admitted to the Charity Hospital June 30, 1912. At the time he was suffering from an acute cellulitis of the left lower extremity, involving the lower part of the thigh and practically the entire leg. This infection was caused by his scratching with fingernails, and with corncobs, an itching surface. Chills and febrile temperature were observed. The cellulitis was treated by multiple longtitudinal incisions under general anesthesia. The acute infection yielded readily to this treatment. But the leg began to swell, and the incisions, instead of healing, remained as callous, foul ulcers. For months dressings were applied and firm pressure was made with bandages, without improvement. Examination on January 2, 1913, showed the measurements of the right leg at the upper and lower extremities and in the middle to be 14 in., 11¾ in. and 14 in., while for the left they were 17 in., 14 in., and 17 in., a difference of 3 in. in circumference, except at the lower end, where it was 2¼ in. A scar 4 in. long was observed at the inner side of the knee. Five ulcers were present on the inner aspect of the leg, varying from 6 in. x 3 in. in dimension to 1½ in. x ½ in., these being the unhealed incisions made for the celluitis. All five were dull, making no effort to heal and covered with foul exudate. The skin of the leg was hard, thick, glossy in spots; it could not be picked up in folds. No varicose veins could be found to account for the disturbed circulation even in part. (Fig. 1.) The foot was edematous, but not elephantiasic.

January 7, after several days of frequent bathing to prepare the leg for operation, the Kondoleon method was applied. On account of the several foul ulcers on the inner side of the leg, no incision was made here. A single longitudinal incision, about 15 in. long, was made on the external surface of the leg and a small transverse cut was made at each end. The skin and subcutaneous fascia were dissected up on

Digitized by Google



MATAS

DR. GESSNER'S PATIENT—FIG. 1 BEFORE OPERATION. FIGS. 2 AND 3 AFTER OPERATION

Digitized by Google

Digitized by Google

each side from the deep fascia; of the latter a long strip, 15 in. in length and varying in width from 3 in. at the top to 1 in. at the lower end of the incision, were dissected up from the muscles and excised. The vessels were tied and the skin was allowed to fall back on the muscles. A few silkworm gut sutures were introduced; copious gauze dressing was applied. The specimen was sent to the Pathologist, Dr. O. L. Pothier, who reported "myxomatous changes in the connective tissue, edema of the same, with hyperplasia of the blood-vessel walls." Primary union followed. The ulcers began to improve, taking on a healthy character, so that Thiersch grafts could be laid on, which grew successfully. March 21, after being up and about a week, the patient presented complete healing of his ulcers and a leg but little thicker than the other, normal, one. At present, he suffers from edema of both legs, attributed to a cardio-renal disturbance. (Figs. II and III.) However, his leg is thoroughly healed, and if the cure should not be a final and complete one, it is reasonable to believe that a repetition of the operation, on the inner side, would make even more satisfactory what is already a good result. The feature of the case which attracted attention after the operation was the prompt healing of the ulcers which had so long resisted treatment and which were so unpromising in appearance at the time.

Conclusions.

In the publication of these clinical reports the authors realize that the evidence furnished is insufficient to prove that a curative method of permanent drainage in elephantiasis or in the elephantoid states have been found in Kondoleon's operation or in the other procedures (Lanz, von Oppel, Rosanow) of which it is a derivative. It must be remembered that the principle of lymphatic derivation by removing the aponeurotic barrier which separates the stagnant from the normal circulating lymphatic areas, which it attempts to establish, is not free from theoretical objection. The excised aponeurosis is bound to be replaced by cicatricial tissue which may block the path of the lymph stream and venous circulation as completely as the normal aponeurosis. The possibility remains, however, that by the massive removal of the obstructing aponeurotic barrier new anastomosing lymph channels and veins (which reproduce themselves with astonishing rapidity) may form between the vessels in the stagnant areas and those in the active, circulating, tissues, and that these will resist the contractile tendency of the newly

Digitized by Google

formed cicatricial tissue. If, in the meantime, all sources of dermal and hypodermal infection can be kept away by asepsis, and antigenous treatment, it is possible that a permanent drainage may be established. It is obvious that the possibilities of the new principle can only be tested by clinical experience and further observation. All that can be said of the observations thus far recorded is that they are encouraging. It is with the hope that the simple procedure of Kondoleon herein described may encourage others similarly placed to give a more extended and thorough trial to the method, that these early observations are recorded.

Bibliography.

Guibé: Traitement chirurgical de l'oedème chronique. Lymphangioplastie ou Drainage capillaire par fils. La Presse Med., Jan. 19, 1910, p. 41.

Handly, W. Sampson. Hunterian Lectures on the Surgery of the Lymphatic System. Brit. Med. Jour., April 9, 1910.

———— Lymphangioplasty: A New Method for the Relief of the Brawny Arm of Breast Cancer and for Similar Conditions of Lymphatic Oedema. Lancet, 1908, i, p. 783.

———— (A) Prospective Cure for Elephantiasis. Lancet, 1909, i, p. 31.

Kondoleon: Die chirurgische Behandlung der Elephantiastichen Oedema durch eine neue Method der Lymphableitung. Münch. Med. Woch., Dec. 10, 1912, pp. 26-27.

———— Die Lymphableitung als Heilmittel bei chronischen Oedema nach Guetschung. Münch. Med. Woch., March 5, 1912, No. 10.

————Die Operative Behandlung der Elephontiastichen Oedema Zentralbl. f. Chir., July 27, 1912, pp. 1022-23.

Lanz, O. Eroffrung neuer Abfuhrwege bei Stauung in Bauch und unteren Extremitaten. Zentralbl. f. Chir., Jan. 7, 1911, p. 3.

———— Méthode pour établis une circulation lymphatique collaterale par le traitement de l'Oedème chronique et de l'elephantiasis. Butt. et Mem. Soc. de Chir. de Paris, 1912, xxxviii, p. 1340.

LeDantec, A. Précis de Pathologie Éxotique. 1905, 2me edition. Paris.

Lenormant: Les tentatives de dérivation lymphatique dans le traitement des états elephantiasiques des mêmbres. La Presse Medicale, Jan. 18, 1913, p. 53 et seq.

LeRoy des Barres: Études de Pathologie Exotique. Paris, 1912, p. 120 et seq.

Madden, F. C., Ibrahim, A., and Ferguson, A. R. On the treatment of elephantiasis of the legs by lymphangioplasty. Brit. Med. Jour., Nov. 2, 1912, pp. 1212-1214.

Matas, R. Remarks on Elephantiasis in the South. Trans. So. Surg. and Gyn. Assn., 1911, in discussion of Dr. Van der Veer's paper, pp. 426-428.

Rosanow, W. N. Lymphangioplastic bei Elephantiasis. Archiv. f. Klin. Chir., 1912, Bd. 99, p. 645.

Unna, P. G. The Histopathology of the Diseases of the Skin (Walker's translation) Clay. Edinburgh. 1896, p. 492 et seq.

Van der Veer, A. Lymphatic Oedema: Observations and Remarks, with Report of Operations. Trans. So. Surg. and Gyn. Assn., 1911, vol. 24, p. 409 et seq.

Digitized by Google

Wellman, Creighton. Brief Conspectus of the Tropical Diseases Common in the Highlands of West Central Africa. Jo. Trop. Med., Feb. 15, 1904, p. 53.

———— Notes on the Tropical Diseases of the Angola Highlands. N. Y. Med. Jo., Aug. 12, 1905. (4 figures.)

———— Notes on Some of the More Obvious Disease Conditions seen on the Line of the Projected Lobito-Katanga Railway. Jo. Trop. Med., Nov. 1, 1906. (2 figures.)

———— List of the Cutaneous Affections observed in Angola, West Africa. Am. Jo. Derm., February, 1907, p. 60. (1 figure.)

———— On the Aetiology of Elephantiasis arabum. Jo. Trop. Med. and Hyg., April 15, 1908, p. 118.

Digitized by Google

TRANSACTIONS OF THE AMERICAN SOCIETY OF TROPICAL MEDICINE

SECRETARY'S REPORT.

Tenth Annual Meeting of the American Society of Tropical Medicine, 1913.

By John M. Swan, M. D., Rochester, N. Y.

Mr. President and Members of the American Society of Tropical Medicine:

It seems fitting at this time, the tenth annual meeting, to review briefly the work of the Society and to point out the important events in its history. Heretofore your Secretary has not inflicted a long report upon you; but he asks your indulgence this year while he points out the path by which you have reached your present position.

The American Society of Tropical Medicine owes its origin to the farsightedness and broadmindedness of Dr. Thomas H. Fenton, of Philadelphia. On January 29, 1903, Dr. Fenton had the following letter mailed from his office to a number of the prominent physicians in Philadelphia:

> Dear Doctor—As is well known, there are many areas within the United States proper which are subtropical, and the new possessions of our country are almost wholly tropical. This would seem to make it necessary that the profession should give closer attention, perhaps, to what are considered tropical diseases. It will certainly be admitted that in a center of medical education like Philadelphia, there should be opportunity afforded for this kind of study. This view is confirmed by the recent establishment in this city of a series of lectures on "Tropical Diseases." I have thought for a long time that the existence of a society, at the meetings of which these topics would be considered, would perhaps act as a stimulus to the promotion of these studies, and favor the development and increase of our knowledge in this particular direction. All to whom I have spoken are heartily in accord with the proposal, and seem, furthermore, willing to join such an organization. The society need not be a large one nor involve, by frequent meetings, too much tax upon the time of a busy practitioner. If you incline favorably to the view expressed, I shall be glad to have you meet a few physicians at my house Monday evening, February 2nd, at 8:15, for the purpose of discussing the expediency of forming such a society.
>
> Very truly yours,
> THOS. H. FENTON.

As a result of this letter an informal meeting was held on February 2nd in Dr. Fenton's office. At this time it was decided to form a society in Philadelphia for the study of Tropical Diseases. The original idea was that the members of the society should be somewhat restricted in

Digitized by Google

number; that a list of honorary and corresponding members should be drawn up; and that the meetings should be confined to three or four during the year. At that meeting a committee composed of Dr. Wharton Sinkler, Dr. James N. Anders, Dr. Judson Daland, Dr. Joseph McFarland, Dr. James C. Wilson and Dr. Thomas H. Fenton as secretary, was appointed. That committee sent out a second letter under the date of February 28, 1903, calling a general meeting of those interested, on March 9th, at Dr. Fenton's office. At that meeting fifteen men were present. Dr. Roland G. Curtin was elected chairman of the meeting and Dr. Thomas H. Fenton was elected secretary. In addition to the fifteen men who attended the meeting, letters were read from twenty-four other Philadelphia physicians, signifying their cordial coöperation with the purposes of the meeting. A committee composed of Dr. John V. Shoemaker, Dr. B. Franklin Stahl, Dr. Orville Horwitz, Dr. E. B. Gleason and Dr. Joseph McFarland was appointed to complete the organization of the Society and a recess was taken pending the report of the committee. When the committee on organization had reported, it was voted that the ideas set forth in the circular letter sent out by Dr. Fenton on February 28th be those which should dominate the new Society. It was voted that the officers should be a president, two vice-presidents, a secretary, an assistant secretary, a treasurer, and a council of seven, of which the president and the secretary should be *ex-officio* members. It was further voted that the council should be empowered to invite members of the medical profession in Philadelphia, to the number of 125 or 150, to become active members. The committee made the following nominations: President, Thomas H. Fenton; vice-presidents, James C. Wilson and James M. Anders; secretary, Joseph McFarland; assistant secretary, not named; treasurer, E. B. Gleason; councillors, John V. Shoemaker, Roland G. Curtin, Orville Horwitz, Judson Daland and Hobart A. Hare. These officers were elected. It was further voted that the Society should be known as the Society of Tropical Medicine of Philadelphia.

It was the original intention of the founders of the Society to have two or three meetings a year in Philadelphia to which, in addition to the local medical profession, the members of the senior classes of the Philadelphia medical colleges should be invited. Shortly after this meeting, Dr. John M. Swan was appointed assistant secretary of the Society by the Council.

On March 20th, the Council met at the Art Club in Philadelphia, and after some informal discussion, Dr. E. B. Gleason moved that the Society be known as The American Society of Tropical Medicine. The motion was seconded by Dr. Judson Daland, and after some further discussion it was carried. The secretary was authorized to send a circular letter to scientific men in various parts of the country who were known

Digitized by Google

to be interested in tropical medicine in any of its bearings, inviting them to become active members.

On May 25th the Council met again and adopted articles of incorporation and by-laws. On the first of June the Society met at Dr. Fenton's office and listened to an illustrated lecture on Leprosy by Dr. Judson Daland.

On January 9th, 1904, the first public meeting of the Society was held in the auditorium of Houston Hall, University of Pennsylvania. Dr. James Carroll, Surgeon, United States Army, delivered an address on the Etiology of Yellow Fever.

On February 18th, 1904, Dr. Fenton presented the Society with its charter, accompanied by a receipted bill for the fees pertaining to the grant.

The first annual meeting was held on Monday evening, March 21st, 1904, in the hall of the College of Physicians, Philadelphia. Dr. W. M. L. Coplin exhibited a number of pathological specimens illustrating tropical disease. Dr. Joseph McFarland exhibited specimens of the Leishman-Donovan body which had been presented to the Society by Sir Patrick Manson. Dr. Allen J. Smith exhibited some specimens of *Hymenolepis nana*. Dr. Fenton was re-elected president.

At a meeting of the Council held December 16th, 1904, it was voted to submit an amendment to the by-laws at the next annual meeting so that the Council should become a continuing body, to that end, three of the Councillors elected in 1905 should be elected for two years each and two should be elected for one year each. After that each Councillor was to be elected for two years. At this meeting Dr. Roland G. Curtin, Dr. Seneca Egbert and Dr. Joseph McFarland were elected to represent the Society at the Fourth Pan-American Medical Congress, to be held at Panama, January 4-7, 1905.

The second annual meeting of the Society was held in the hall of the College of Physicians, Philadelphia, on March 25th, 1905. The delegates appointed by the Council to attend the Pan-American Medical Congress, held at Panama, read papers. Dr. Seneca Egbert's paper was entitled "History of the Republic of Panama and the Panama Canal." Dr. Joseph McFarland's paper was entitled "The Canal Zone." Dr. Roland G. Curtin's paper was entitled, "Medical Conditions of the Isthmus of Panama." At that meeting Dr. Roland G. Curtin was elected president. Dr. Creighton Wellman, at that time located at Benguella, Angola, West Africa, was elected a corresponding member.

At the meeting of the Council held on April 6th, 1905, the secretary reported the receipt of several letters, two manuscripts and a box of microscopic slides, a box of parasites in alcohol, and a box containing some ticks from Dr. Wellman. The manuscripts were entitled "Recurrent Fever" and "Experiences in Tropical Medicine in West Africa." From that day to the present Dr. Wellman has been one of the most

Digitized by Google

active members of this Society and our Transactions contain many valuable articles from his pen.

The second public meeting of the Society was held in one of the lecture rooms of the Jefferson Medical College on the evening of November 17th, 1905. A paper by Dr. Creighton Wellman on "The Study of Tropical Medicine" was read by the secretary. Dr. Claude A. Smith of Atlanta delivered an address on Uncinariasis, which was illustrated by lantern slides and specimens.

The third public meeting of the Society was held in the clinical amphitheater of the Medico-Chirurgical College of Philadelphia on December 8th, 1905. Dr. W. C. Gorgas delivered an address entitled "The Relation of Mosquitoes to Yellow Fever on the Isthmus of Panama."

The third annual meeting was held in the hall of the College of Physicians, Philadelphia, on March 21st, 1906. At that meeting, the president, Dr. Roland G. Curtin, was seriously ill, and Dr. James M. Anders, one of the Councillors, occupied the chair. Dr. Charles Wardell Stiles exhibited a specimen of the then New Asiatic Blood Fluke, *Schistosomum japonicum*, and read a paper entitled "A New Species of Parasite in Man." A paper by Dr. W. C. Gorgas, entitled "Malaria in the Tropics," was read by the secretary, and a paper by Dr. Aristides Agramonte of Havana, entitled "Clinical Notes upon a Recent Epidemic of Dengue Fever," was read by the assistant secretary.

Three other papers were read by title. At this meeting the method of electing Councillors so that the Council should be a continuing body was overlooked, and was voted upon favorably at the next annual meeting.

The fourth public meeting of the Society was held on December 7th, 1906. At this meeting Dr. John M. Swan described the Organization and Management of the London School of Tropical Medicine. Prof. J. B. Smith, the State Entomologist of New Jersey, read a paper entitled "The Economic Importance of Mosquitoes." Mr. H. L. Viereck, of the Pennsylvania State Board of Health, described "The Mosquitoes of Pennsylvania with Special Reference to Their Breeding Places." Dr. Joseph McFarland read a paper entitled "The Mosquito Phase of the Life History of the Human Parasites."

At a meeting of the Council held on December 28th, 1906, a letter was read from Dr. Creighton Wellman, in which he announced that he had determined that the intermediate host of *Filaria perstans* is the African Tick, *Ornithodoros moubata*.

The fourth annual meeting of the Society was held at the Academy of Medicine, New York City, on March 29th, 1907. At this meeting papers were read: "On Yellow Fever Sanitation, with Special Reference to Mild Cases," by Dr. L. W. Spratling; "Observations on Health and Disease in Eastern Africa," by Dr. Louis L. Seaman; and on "Abscess of the Liver in the Philippines," by Dr. E. W. Pinkham. At

Digitized by Google

this meeting Dr. James M. Anders was elected president. Dr. Joseph McFarland retired from the office of secretary and Dr. John M. Swan was elected secretary in his place. At a meeting of the Council held April 25th, 1908, it was voted to request the Trustees of the Philadelphia Polyclinic and College for Graduates in Medicine to allow the Society the use of the College at its headquarters and to give it room for the storage of its library and museum. At that time the secretary was offering a course in Tropical Medicine at the Philadelphia Polyclinic and the request of the Society was readily granted by the Trustees of the institution.

The fifth public meeting of the Society was held in the amphitheater of the Philadelphia Polyclinic Hospital on June 7th, 1907. Dr. Joseph H. White read a paper on "The Prophylaxis of Tropical Diseases, with Especial Reference to Yellow Fever." An exhibition of specimens bearing upon Tropical Medicine was prepared in the Polyclinic laboratories, which was inspected by the members and guests after the address.

The fifth annual meeting was held at the Johns Hopkins Hospital, Baltimore, March 28th, 1908. At this meeting a program occupying a morning and an afternoon session was presented. In addition to the reports of the officers, eleven papers were read and nine papers were read by title. A demonstration of live and stained specimens of spirochaetes and typanosomes and of gross and microscopic specimens illustrative of tropical pathology, was given. Through the courtesy of Dr. William S. Thayer, one of the vice-presidents, Dr. Hurd and the Trustees of the Johns Hopkins Hospital, luncheon was served in the hospital. In the evening a subscription dinner was given at the Hotel Belvedere. At this meeting Dr. James M. Anders was re-elected president.

The sixth annual meeting was held at the United States Naval Medical School, Washington, April 10th, 1909. The scientific business of the Society consisted in the reading of fifteen papers and of thirteen papers by title. The officers connected with the United States Naval Medical School and of the United States Army Medical School gave an exhibition of pathological specimens. At this meeting medical officers were present as official representatives from the United States Army, the United States Navy, and the United States Public Health and Marine Hospital Service, and of the Louisiana State Board of Health. Dr. William C. Gorgas was elected president.

The seventh annual meeting was held at the Medical School of the St. Louis University, St. Louis, June 11th, 1910. At this meeting the scientific business consisted in the reading of fourteen papers, and ten papers were read by title. At this meeting Dr. William S. Thayer was elected president.

The eighth annual meeting was held in New Orleans, May 18th and 19th, 1911. The meeting occupied two days. The scientific business

Digitized by Google

consisted in the reading of twenty-one papers. There were numerous demonstrations of gross and microscopic specimens and lantern slides. Seven papers were read by title. The first session was held in the rooms of the Orleans Parish Medical Society. The second session was held in the Richardson Memorial Building of Tulane University. The third session was held in the amphitheater of the Chemical Building of Tulane University. The fourth and fifth sessions were held in the Hutchinson Memorial Building of Tulane University. The cordial hospitality of the members of the Society residing in New Orleans, and of their friends, will long be remembered by those who attended that meeting. Dr. Joseph H. White was elected president.

The ninth annual meeting was held at the Hotel Rudolf, Atlantic City, June 3rd, 1912. The scientific business consisted in the reading of eleven papers, and six papers were read by title. At this meeting Dr. Creighton Wellman announced that a member of the Society, Dr. C. C. Bass, had succeeded in cultivating the malarial parasite *in vitro*, and that he had been able to follow all the stages of schizogony. The secretary announced that the Society had been admitted to affiliation with the Congress of American Physicians and Surgeons. Dr. E. R. Stitt was elected president.

At the meeting of the Council in 1912, the secretary was authorized to send out a circular letter to the members of the Society, requesting subscriptions not larger than five dollars for starting of a library fund, for the purpose of binding the various periodicals and pamphlets contained in the Society's library.

As a result of this appeal the sum of $74 was received by the Secretary and turned over to the treasurer for the purpose mentioned. The following members contributed: Roland G. Curtin, James S. McLester, William Krauss, Thomas H. Fenton, James M. Anders, Sherman G. Bonney, Henry J. Nichols, John T. Moore, Richard P. Strong, Maximilian Herzog, W. C. Gorgas, Judson Daland, Samuel G. Dixon, Egbert LeFevre, L. Leffingwell Hatch, Allen J. Smith, T. B. Futcher.

PROCEEDINGS OF THE COUNCIL.

The Council of the Society met Monday evening, May 5th, 1913, in the Hotel Bellevue. The following members of the Council were present: Dr. Edward R. Stitt, Dr. C. C. Bass, Dr. Roger Morris, Dr. Henry J. Nichols, Dr. Ramon Guiteras, Dr. John M. Swan. A telegram was received from Dr. Seale Harris, regretting his inability to attend the meeting.

The Council recommended the following candidates for election to active membership: Dr. Henry S. Houghton, Shanghai, China; Dr. Damaso Rivas, Philadelphia; Dr. Richard H. Creel, United States Public Health Service; Dr. Frazer B. Gurd, Montreal.

The Council recommended the election of the following officers for the ensuing year: President, Dr. Richard P. Strong, Boston; vice-

Digitized by Google

presidents, Dr. Creighton Wellman, New Orleans, and Dr. Charles F. Craig, Washington; secretary, Dr. John M. Swan, Rochester, New York; assistant secretary, Dr. Allen J. Smith, Philadelphia; treasurer, Dr. Joseph D. Weis, New Orleans. Councillors (to serve two years), Dr. C. C. Bass, New Orleans; Dr. Joseph H. White, United States Public Health Service. Eight members were dropped from the roll for non-payment of dues. Dr. George Dock, Dr. William H. Welch, Dr. Creighton Wellman and Dr. Isadore Dyer were appointed a committee to confer with a similar committee from the American Medical Association concerning the advisability of holding a congress of Tropical Medicine in San Francisco in 1915 in connection with the Panama-Pacific Exposition, with power to act.

Boston was selected as the place of meeting in 1914.

A letter from Dr. William W. Keen, requesting a contribution from the Society as a body or from individual members to the Lister Memorial Fund, was ordered to be brought to the attention of the members, so that those who wished to contribute to this fund might have the opportunity to do so. Dr. John M. Swan and Dr. Creighton Wellman were appointed delegates from the Society to the Fourth International Congress on School Hygiene, which will be held in Buffalo, August 25th-30th.

Dr. C. C. Bass proposed the following amendment to the charter of the Society: "It is moved that the charter of the American Society of Tropical Medicine be amended by striking out Section IV, which reads, 'The location of the secretary's office shall be in the City of Philadelphia,' and renumber the other sections of the charter so that Section V shall be Section IV; Section VI shall be Section V, and Section VII shall be Section VI." The motion was seconded by Dr. Roger Morris. Carried.

Dr. C. C. Bass moved that the Society adopt the American Journal of Tropical Diseases and Preventive Medicine as its official organ. And that one dollar per year for each active member, corresponding member, and honorary member, be paid to the publishers of the Journal. It was stated that the American Journal of Tropical Diseases Company, Limited, would mail the Journal monthly to each member of the Society and that the papers read before the Society and the discussions would be published promptly. It was also agreed by the Journal of Tropical Diseases Company, Limited, to manufacture the proceedings of the Society at cost. Dr. Henry J. Nichols seconded the motion. It was carried. It was moved and seconded that the president and secretary of the Society be *ex-officio* members of the advisory board of the American Journal of Tropical Diseases and Preventive Medicine. Carried. It was moved and seconded that the dues of active members for 1914 be $4.00. Carried.

Digitized by Google

MEMBERSHIP.

At the last annual meeting there were 120 active members, 17 corresponding members and 37 honorary members of the Society. During the year the secretary has received notices of the death of four members: Dr. P. E. Archinard of New Orleans, who was elected in 1905; Dr. G. C. Crandall of St. Louis, who was elected in 1912; Dr. Roland G. Curtin of Philadelphia, a charter member and an ex-president, and Dr. Frank H. Watson of New Orleans, who was elected in 1908. Five members have resigned. At the last annual meeting ten active members were elected, so that on April 30, 1913, the membership of the Society consisted of 121 active members, 17 corresponding members, and 37 honorary members; a total of 175.

Digitized by Google

NEWS AND COMMENT

Dr. S. Lykles, for many years in the Dutch Indian Medical Service, died recently in Amsterdam.

Dr. Enrique Nunez has been appointed Minister of Sanitation in the Cabinet of President Menocal of Cuba.

Dr. Franklin D. Barker has been appointed Professor of Medical Zoology and Parasitology in the University of Nebraska.

The Board of Aldermen of New York has just voted a special appropriation of $37,000 to the Health Department for spring cleaning.

The trustees of the late Sir Julius Wernher have allocated £1500 to the fund for the extension of the London School of Tropical Medicine.

Dr. Hans Zinsser has been appointed Professor of Bacteriology in Columbia University, filling the vacancy caused by the death of Dr. Philip Hanson Hiss.

Dr. William H. Welch, Professor of Pathology at Johns Hopkins Medical School, has been elected president of the American National Academy of Sciences, for a term of six years.

Dr. Argyll Campbell, assistant to Professor Schaeffer, University of Edinburgh, has been appointed Professor of Physiology in the Medical School at Singapore.

Major S. P. James, Indian Medical Service, whose name is so well associated with mosquito research, has been transferred from Simla to Ceylon for special duty under the Government.

Dr. C. W. Young, Professor of Pathology and Bacteriology in Peking, China, Union Medical College, delivered a lecture on Manchurian plague conditions, at Baltimore, May 18.

Digitized by Google

Dr. Alexis Carrel, well known for his work on the Survival of Tissues and other researches, has been made a Knight of the Royal Order of Isabella the Catholic, by King Alphonso of Spain.

The University of Cincinnati has received a gift of $125,000 from Mrs. M. M. Emory of that city. The donation is to be used for the endowment of a chair of Pathology in the Department of Medicine.

The Fourth Italian Congress of Occupational Diseases was held at Rome, June 8-11, under the presidency of Professor Guido Baccelli. The subject of hookworm disease came in for a great deal of discussion.

The Paris Academy of Sciences has awarded prizes of the value of £100 each to Dr. Carlos Finlay and Dr. Aristides Agramonte, of Havana, Cuba, in recognition of their researches into the etiology of yellow fever.

Assistant Surgeon Frank W. Thomas, U. S. N., died at Newport, R. I., May 13, 1913, of pneumonia. He was attached to U. S. S. Montgomery and received his appointment in the Navy March 5, 1910. He was a native of Connecticut.

The degree of Doctor of Science was conferred upon Col. W. C. Gorgas, Assistant Surgeon General, Medical Corps of the United States Army, by Columbia University at the 159th Annual Commencement, held on June 4.

Major Thomas L. Rhoades, Medical Corps, U. S. A., who was recently stricken with an acute attack of appendicitis and was operated on at the Walter Reed Hospital by Captain William A. Wickline, U. S. A., has now entirely recovered.

A recent report by Dr. Gorgas, Chief Sanitary Officer of the Isthmian Canal Commission, shows that in 1912 the annual death rate among employees in the Canal Zone was only 7.14 per thousand, as against 10.42 in 1911, and 45.73 in 1905.

Digitized by Google

The Rockefeller Institute of Medical Research was recently made the legatee of a gift of $200,000 for cancer investigation, through the will of the late Henry Rutherford, of Grand Isle, Vt

Mrs. George William Hooper, of San Francisco, has donated $1,000,000 to the University of California for the establishment of an institute for medical research at the University. The gift was made as a memorial to the husband of the donor.

The King of England has granted permission to Captain William Byam, R. A. M. C., to accept and wear the Imperial Ottoman Order of the Medjidieh (Fourth Class), conferred upon him by the Khedive of Egypt in recognition of valuable services rendered.

The Royal Academy of Medicine of Turin awarded the Riberi Prize of 20,000 francs to Dr. Luigi Pagliani, Professor of Hygiene at the University of Turin and Dean of its Medical Faculty, for his recently published "Trattato di Igiene."

The Maryland University School of Medicine, Baltimore, has instituted a course of Tropical Medicine, under the direction of Surgeon J. A. Nydegger, of the United States Public Health Service, with the assistance of Dr. C. W. Stiles and other members of the same service.

The Governments of Norway and the Principality of Monaco have given adherence from January 1, 1913, to the arrangement signed in Rome on December 9, 1907, by which the International Office of Public Hygiene was created in Paris. The number of countries which now take part in the work is twenty-nine.

Mr. F. C. Danson, J. P., has been appointed Chairman of the Liverpool School of Tropical Medicine, vice Sir William Lever, who recently resigned. Mr. Danson has been connected with the School almost from its beginning and was formerly Vice Chairman, a position which is now occupied by Dr. Richard Caton.

The Twelfth International Congress of Ophthalmology will

Digitized by Google

be held at St. Petersburg in August, 1913, under the patronage of the Czar. The subjects proposed officially for discussion are the etiology of trachoma and the nutrition of the eye. The official languages will be French, English, German, Russian, Spanish and Italian.

The University of Pennsylvania received a gift of $10,000 from Steven Heckscher to establish a fellowship in medical research. The fellowship is to be a memorial to Mr. Heckscher's wife. This gift was made through Dr. Alfred Stengel, head of the Department of Medicine of the University of Pennsylvania.

Finding that the short title of the diploma in Tropical Medicine and Hygiene, namely, D. T. M., England, was not sufficiently descriptive, in that it omitted a reference to Hygiene in the title, the Censors' Board recommended to the Committee of Management of the Royal College of Physicians that the short title of the diploma be changed from D. T. M., England, to D. T. M. and H., England.

Dr. Richard P. Strong, Director of the newly established Department of Tropical Medicine of Harvard University, in company with Dr. E. E. Tyzzer and Mr. C. T. Brues, is now in South America, studying *verruga*, a disease endemic in the valleys of Peru. As soon as Dr. Strong completes his investigation in Peru, it is his intention to go to Brazil to conduct researches into the etiology of Beri-beri.

A report from Panama states that the consolidation of the supervisory forces has begun, and will be continued throughout the summer as various parts of the work are completed. The four main divisions have been reduced to three and the engineering and supervisory force is in process of reduction. About July 1 wholesale reductions in the working forces will begin and this will affect other departments.

A dispatch from Washington, D. C., states that on May 6, President Wilson received a representative joint delegation

Digitized by Google

from the American Medical Association and the Committee of One Hundred on Conservation of Health, of the American Academy of Sciences, in the interest of the Owen Bill for the establishment of a Cabinet Department of Public Health. The delegation consisted of Dr. George H. Simmons, Dr. Abraham Jacobi, Dr. Harvey W. Wiley, Prof. Irving Fisher, Dr. John B. Murphy and Dr. Favill.

The Fourth International Congress for the Hygiene and Salubrity of Dwellings will be held in Antwerp, August 31-September 7, 1913. The president is Dr. Victor Desguin and the secretary-general Walther Van Kuyck. Section II will be devoted to Colonial Hygiene and among the questions discussed will be (1) Private dwellings, (2) Collective dwellings (mining enterprises, plantations, etc.), and (3) Infirmaries and hospitals. The chairman of the American Committee on the Congress is President Nicholas Murray Butler of Columbia University.

Professor Rudolf Kraus, who lately served the Bulgarian Government in controlling the outbreak of cholera during the Balkan War, has accepted the Directorship of the Institute of Infectious Diseases, in Buenos Aires. Among his duties will be the organization of a prophylactic and therapeutic crusade against infectious diseases of all kinds among cattle, as well as among the human population. The loss of such an eminent teacher and investigator is greatly felt in Viennese scientific circles, and his popular course of lectures on Immunity will be much missed by the student population. Professor Kraus leaves for his new post in the early part of July.

At a recent meeting of the Medical Association of Greater New York City the evening was devoted to diseases and conditions of the Philippine Islands and was known as Army Night. The following was the program: Sanitary Problems in the Philippines on American Occupancy, by Col. L. M. Maus, Medical Corps, U. S. A.; Observations on Beri-beri in Japan and in the Philippines, by Major Louis T. Hess, Medical Corps, U. S. A.; Dysentery in the Tropics, by Major E. R. Whitmore,

Digitized by Google

Medical Corps, U. S. A. The general discussion was opened by Dr. William Sharpe. The meeting was well attended and a vote of thanks was given the speakers for their valuable papers.

An exchange scholarship has been arranged between the Institut für Schiffs-und Tropenkrankheiten in Hamburg and the Tulane School of Hygiene and Tropical Medicine, which includes tuition, laboratory expenses, and all other fees. By the terms of the agreement between the two schools, the German holder of the scholarship will come to New Orleans and the American holder will go to Hamburg. At each school the student will be given special opportunity to do research and the men will be chosen principally on account of scholarship and aptitude for original investigation. The scholarship is open to but one student a year from each institution.

A bill, having for its object the regulation of the importation and sale of foreign pharmaceutical products, is now before the Cuban Parliament. One of the most important provisions of the bill is that foreign specialties are not to be allowed to circulate in Cuba unless the agent intrusted with the sale of them is a registered pharmacist of Cuba. Further, the specialties must conform to the following conditions: First, the label must indicate the components to which the product owes its therapeutic activity; second, the Cuban Academy of Sciences must satisfy itself that the preparation really possesses the properties claimed for it; third, a certificate will be required, showing that the product has been made in laboratories which work according to the law of the country from which it comes.

Digitized by Google

CURRENT LITERATURE

Color Marking and Other Variable Characters of Anophelines.—(Annals of Tropical Medicine and Parasitology, vol. vii, 1, March 31, 1913, pp. 45-100.) S. R. Christophers in an elaborate paper emphasizes the color markings, especially the "leucogenic centers" of the wing, as valid characters for grouping the species of Anophelines. Using such characters, he arranges the group in three divisions: (1) Protoanopheles, containing such genera as *Stethomyia*, *Anopheles*, *Myzorhynchus*, etc.; (2) Deuteranopheles, including *Myzomyia*, *Pyretophorus*, *Nyssorhynchus*, *Cellia*, etc.; and (3) Neoanopheles, which comprises the Australasian and Malayan series. Christophers considers that a grouping based on color marking, supported by structural differences in the palpi and larval characters, approximates very closely the results of classification by scale structure, but that the relations and affinities between the groups are much more clearly brought out by the former characters than by scale classification. Creighton Wellman.

The Parasitic Amoebae. (Southern Medical Journal, vi, 6, June, 1913, pp. 370-377). C. F. Craig reviews in a masterly manner the present status of our knowledge of these organisms. Craig lends his authority to the idea now gaining ground, namely, that *Entamoeba histolytica* and *Entamoeba tetragena* are identical. He writes as follows: "There is no doubt that Schaudinn failed to describe the typical cysts of *tetragena* in material which he examined, but as *tetragena* is identical with *histolytica*, he simply failed to discover the method of reproduction by the formation of the characteristic four nucleated cysts, and misinterpreted certain degenerative changes, as reproduction by budding of spore formation. He accurately described a part of the life cycle and therefore his name must displace that of *tetragena*." Craig considers it best at present to recognize but two species of entamoebae as parasitic in the intestine of man, viz., *coli* and *histolytica*.

C. W.

Trypanosoma rhodesiense and T. gambiense. (Annals of Tropical Medicine and Parasitology, vol. vii, 1, March 31, 1913, pp. 27-39.) J. W. W. Stevens and H. B. Fantham give further measurements of these parasites. They are unable to distinguish between the two forms by measuring one thousand specimens of each, although they hold that the two species are distinct. The most important differential feature is the posterios nuclear character of *rhodesiense*. C. W.

A Glanders-like Disease Occurring in Rangoon. (Journal of Hygiene, xiii, 1, April, 1913, pp. 1-34.) A. Whitmore describes a strange

Digitized by Google

infectious disease somewhat resembling glanders. The pathological lesions are distinguishable from those caused by any of the usual pathogenc bacteria and the organism itself, while morphologically allied to *B. mallei*, is not to be identified with that species or with any known bacillus. The disease seems to be specially prevalent among morphine injectors. Thirty-eight cases are carefully studied and the pathological findings given in detail. C. W.

Zambesi Fever. (Transactions of the Society of Tropical Medicine and Hygiene, vi, 5, April, 1913, pp. 173-174.) W. J. Bruce, writing from the Zambesi region of Portuguese East Africa, reports that "Zambesi Fever," formerly supposed to be atypical malaria, is in reality Malta Fever. He failed to find malarial parasites in the blood, but the serum of several patients gave positive reactions with *M. miletensis*. The disease runs a long course and was clinically suggestive of Malta Fever. C. W.

Animal Trypanosomiasis in Nigeria. (Annals of Tropical Medicine and Parasitology, vii, 1, March 31, 1913, pp. 1-26.) J. W. S. Macfie in Northern Nigeria found in the blood of domestic animals trypanosomes presenting the morphological characters of *brucei*, *vivax*, *nanum* or *pecorum*, and *theileri*. Of these *brucei* was found in the blood of horses, donkeys, cattle and sheep. Horses, donkeys, cattle, sheep, goats and dogs harbored *vivax*. Horses, cattle and sheep carried *nanum*, and *theileri* was found in dwarf cattle only. Of these forms *vivax* is the commonest. In horses *brucei* gives rise to a much more serious disease than *vivax* and dwarf cattle recovering from infection with *vivax* succumbed to *brucei*. C. W.

Tropical Diseases in Palestine. (Journal of Hygiene, xiii, 1, April, 1913, pp. 49-62.) E. W. G. Masterman, writing from Jerusalem, laments the lack of sanitary conditions due to the remissness of the Turkish Government, and local conditions. As things are, Jerusalem and most of Palestine are, in the opinion of the author, quite unfit for colonization. Malaria is widely distributed. *Anopheles maculipennis*, *Pyretophorus palestinensis*, *Myzorynchus psuedopictus*, *Cellia pharoensis* and *Anopheles bifurcatus* are the common Anopheline mosquitoes, the last mentioned being a cistern breeder. April is the healthiest month, the percentage of infections remaining under 10 per cent, and November is the most dangreous, the percentage reaching 50 per cent. Hemoglobinuric Fever is not uncommon. An epidemic of Dengue visited Syria during 1912, and has been endemic upon the coast for years. According to Masterman, it must be distinguished from Three-days Fever. Masterman regards the so-called Dengue parasites described by Graham to be the same as Cropper's bodies and to be considered simply as physical changes in the erythrocytes. C. W.

Digitized by Google

A New Pathogenic Organism in Man. (Centralbl. f. Bakt. 1. Abt., Orig. 1913, March, lxviii, 3, p. 318-322.) O. L. De Raadt is of the opinion that he has, with the finding of small bodies in the spleen of a patient in the Lazaretto of Long Isram, Central Borneo, discovered a new excitant of human disease. The patient was a Javanese soldier aged 44, with a previous history of malarial infection of an unknown type. Upon admittance to hospital he had quite a high temperature; no history of previous chill or shivering marked the febrile onset. Examination for the malarial organism proved negative. The spleen could be distinctly felt, but not so the liver. Diagnosis was uncertain—the condition was diagnosed on one occasion as malaria and on another as enteric fever. A temperature chart accompanies this most interesting paper, together with the therapy employed throughout the entire case. Of the most interesting features of the case may be mentioned, first, the marked emaciation, and, second, the variability in the size of the spleen. The necropsy held shortly after death brought out the following details: The lungs were markedly pigmented. The weight of the spleen was 200 grammes, and on section of the capsule the pulp actually spouted out. The liver weighed 1350 grammes and was free from any cirrhotic changes. As a result of the necropsical findings it was believed that death was due to some infectious process. The author believes that certain minute bodies found are micro-organisms of a protozoal character and most likely related to *Babesia*. Von Provazek, who saw the structures, first intimated the possibility of yeasts, but later suggested they might be protozoa of a new class. Swellengrell, who also viewed them, thought they were protozoa, basing his opinion on the researches of Theiler and Balfour's work on *Anaplasma marginale*. After thoroughly testing the preparations from the fungus point of view, Rocha-Lima declared them Gram fast. On account of their very peculiar structure the author has named these organisms *Ovaplasma anucleatum*. He has, since the reporting of the above, been successful in finding the same structures in spleen smears of two other cases. In some cases, he believes, the parasite amy be relatively harmless, but under certain circumstances may undergo pathogenic development. Howard D. King.

Differential Blood Count in Dengue. (Indian Med. Gaz., 1913, February, xlviii, 2, pp. 45-59.) According to W. L. Harnett, during the heated term, from May to September, 1912, this disease was very common in the lower Brahmaputra district. The fever exhibited marked clinical variations, from the three-day type to the saddle-back and irregular continued type. Severe headache and pains in the loins were present in nearly all cases; rash was of common occurrence, being especially observed in Europeans. The hematologic aspect of the epidemic was not neglected; aside from the familiar leucopenia, decrease in the polymorphonuclear leucocytes, and a relative increase in the lympho-

Digitized by Google

cytes, a marked eosinophilia was observed, the average in 24 cases being 13.8%. The estimation in a majority of cases was made from a count of 200 leucocytes. The greater number of the patients were Asiatics, but, strange to relate, in several examinations for intestinal ova the findings proved negative, and a number of blood examinations on patients suffering from "three day" fever at a nearby village presented the same characteristics. The author is of the opinion that leucopenia with a rapidly developing eosinophilia is a distinguishing feature observed toward the end of the first week of an invasion of dengue, and that this characteristic may prove of service in solving the etiological controversy as to whether "three day fever," "seven day fever" and dengue are one and the same morbid process. However, further observations are necessary for the settlement of this moot point. H. D. K.

Typhus in the United States. (Jour. Amer. Med. Assn., 1913, June 14, lx, 24, p. 1845.) J. F. Anderson first defines the scope of the recent researches of typhus in the United States. He calls attention to a series of cross-immunity tests on monkeys whereby it was established that the "so-called Brill's disease" and typhus were one and the same disease. The author lays great stress on the work of Anderson and Goldberger in 1912 and concurs in their view that typhus is actually present at all times in certain large cities of the United States; in fact, he believes it is more widespread than they declared. Accepting the ratio of one case of typhus to forty-seven of typhoid as found by Lee in the Massachusetts General Hospital, Anderson estimates that during 1912 172 cases of typhus occurred in New York, Philadelphia, Baltimore, Chicago, Washington and Boston. That this is not an altogether unwarranted assumption is seen from the fact that the ratio of typhus to typhoid in the Jewish Hospital in New York for the three years of 1910, 1911, and 1912, was 1 to 2.6, instead of the ratio of 1 to 47 as found by Lee in Boston. The object of the communication is, according to the author, to secure more accurate information as to the prevalence of the disease throughout the United States. That the disease is to be reckoned with as a new factor in health problems may be gleaned from the fact that one physician alone has reported over 321 cases of the disease. While the disease thus far has had a low death rate and exhibits but little tendency to become epidemic, it is nevertheless apparently always present in the larger cities and the possibility should ever be borne in mind of the disease acquiring virulence and becoming widely diffused. For the purpose of arriving at a correct diagnosis the author suggests the inoculation of guinea pigs with about 3 c. c. intraperitoneally of blood from cases of continued fever giving negative Widal and blood culture; especially in cases in which there has been a sudden onset, an atypical eruption, headache, apathy and prostration. H. D. K.

Digitized by Google

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed.

BOOKS.

The Mosquitoes of North and Central America and the West Indies. By Leland O. Howard, Harrison G. Dyar and Frederick Knab. Volume 1, A General Consideration of Mosquitoes, Their Habits and Their Relation to the Human Species. 520 pages, illustrated with 14 plates and 5 text figures. Volume 2, Plates. Carnegie Institution of Washington, D. C. 1912.

The enormous literature on mosquitoes which has appeared in many languages and widely scattered publications has made their study in any systematic way practically prohibitive to any but the professional entomologist. It is, therefore, with the keenest interest that the first two volumes of this monograph have been received, and in completeness it fulfills our best expectations. Commenced in 1905 upon a grant from the Carnegie Institution, the lack of satisfactory data on any but a few of the commoner species and the acquisition of the abundant undescribed material from the West Indies and Central America delayed the appearance of the work several years.

The first volume will certainly appeal to a wide interest, although it is stated that the work is an "entomological monograph and not a medical monograph." The chapters on the relation of mosquitoes to man give a digest of apparently all of the important work which has connected mosquitoes with the transmission of disease. This will be valuable as a reference work. Following this is an account of the economic losses sustained from mosquitoes through the diseases they transmit, and from the reduction in property values due to their presence. This makes an astonishing total.

Aside from the many original observations, the chief value of the first volume is the gathering together in a readily accessible form this variety of information. The wide experience of the authors permits them to weigh the statements of other writers and to pronounce authoritative opinions on points which have, up to this time, been clouded in doubt.

Many of the older ideas must now be revised. Thus, we learn in regard to blood-sucking habits that "there are few species that absolutely require that article of diet (mammalian blood). Speaking

Digitized by Google

broadly, mosquitoes are flower insects, living upon honey. The habit of taking mammalian blood, while common, is not universal, and seems to be obligatory only in the case of a few species.'' Another observation is that ''there are a great many species, perhaps more than half, which never suck blood at all, while others do so but rarely.'' Of the activity of mosquitoes we read that ''mosquitoes are generally looked upon as nocturnal in habits, but this is probably so in only a small number of species.'' And further, ''the majority of species are never found in homes.'' In regard to hibernation, it is stated that ''with the majority of species of mosquitoes the unfavorable season is passed in the egg stage.'' (p. 119.)

The structure and internal anatomy of mosquitoes is comprehensively given in 80 pages. An excellent account is given of the natural enemies, of the remedial and protective measures which may be directed toward their control, and a number of the most notable examples of practical control work. The volume is completed with a large bibliography and a good index.

The 105 plates in the second volume have been unusually well executed and indicate the care and pains and immense amount of labor which have been spent on the monograph. The drawings of the entire larvae are especially beautiful. It is to be noted that no reference is made to the artists. It is supposed that a good part of these are by Mr. Frederick Knab.

Willard V. King.

Tropenkrankheiten und Tropenhygiene. Von Prof. Dr. Reinhold Ruge, Marine-Generalarzt in Kiel, und Dr. Max zur Verth, Marine-Oberstabsarzt in Kiel. Herausgegeben von Prof. Dr. Ph. Bockenheimer, Berlin. Mit 8 Karten und 201 Abbildungen in Text. Leipzig: Verlag von Dr. Werner Klinkhardt. 1912. Price, 13 m.

This handy and practical manual is a thorough, well-balanced and clearly written treatise dealing with a broad and complex field of medicine, namely, tropical medicine.

The work is divided into two parts devoted respectively to Tropical Hygiene and to Tropical Diseases; the first part is from the pen of Dr. zur Verth, and the second by the two authors jointly, credit being given for the authorship of each chapter.

The first part deals with such subjects as climate, acclimatization, residence in the tropics, water supplies in hot countries, the hygiene of expeditions, the care of the health of native populations, and problems of a similar nature. In the second part tropical diseases are arranged into groups, i. e., infectious diseases (protozoal and bacillary), parasites (worms and arthropods), skin diseases, poisoning (animal and vegetable), and the cosmopolitan diseases observed in the tropics. An

Digitized by Google

appendix contains comparative tables of thermometry and scales of weights and measures of the French and English systems.

The work contains 201 figures in the text and 8 maps. These latter show the geographical distribution of the principal tropical affections.

While not on such a pretentious scale as Scheube's "Krankheiten der Warmen Lænder" or Mense's "Handbuch der Tropenkrankheiten," the present work is nevertheless complete enough to be of great worth for reference, and at the same time so concisly arranged as to make it well adapted for general reading or a student's text.

The reviewer heartily commends it to all students of tropical medicine and hygiene who read German. Creighton Wellman.

A Treatise on Hygiene and Public Health. With Special Reference to the Tropics. By Birendra Nath Ghosh, L. M. S. (Cal. Univ.), Fellow of the Royal Institute of Public Health, London, etc., etc., and Jahar Lal Das, L. M. S. (Cal. Univ.), Health Officer, Maniktala Municipality, Calcutta, etc., etc. With an Introduction by Colonel Kenneth Macleod, M. D., LL. D., F. R. C. S., Indian Medical Service (Retd.), etc. Calcutta: Hilton and Company. 1912. Price, 5s.

Without any claim to originality, this work is a well-balanced and carefully prepared resumé of the data relating to Public Hygiene, specially compiled for the use of tropical practitioners.

Macleod, who wrote the introduction to the book, observes that the chief merit of the treatise "depends on the clearness and accuracy with which it sets forth in plain and simple language the facts and doctrines bearing on causation and prevention which have been accumulated in recent years and the most easy and effective manner of their practical application."

The application of scientific hygiene to tropical health problems is a movement full of promise, and in the present volume we have an example of a work that is well adapted whether as a text-book or manual for native or other physicians and students in tropical regions.

C. W.

Bovine Tuberculosis and Its Control. By Veranus Alva Moore, B. S., M. D., V. M. D., Professor of Comparative Pathology, Bacteriology and Meat Inspection, New York State Veterinary College at Cornell University, etc. Thirty full-page illustrations. Ithaca, N. Y.: Carpenter and Company. 1913. Price, $2.00.

As an epitome of our knowledge of its subject, this book is praiseworthy in nearly every detail.

The history, importance, etiology, pathology, symptomatology, dissemination, diagnosis, treatment and control of the disease are com-

Digitized by Google

pletely discussed. The care with which the question is treated and the various phases of the problem considered render the volume one of great worth. It were well nigh impossible to select any particular chapter for special approval, but Chapter XI on "The Control of Bovine Tuberculosis" is, in the opinion of the reviewer, a model of its kind. The volume deserves to rank with the standard works upon the subject.

The book is enriched with thirty full-page illustrations from photographs. C. W.

The Mosquito. Its Relation to Disease and Its Extermination. By Alvah H. Doty, formerly Health Officer of the Port of New York. Illustrated. New York: D. Appleton and Company. 1912.

This little book is a popular narrative dealing with the mosquito and its extermination. While the text contains a number of scientific data, the greatest merit of the work lies in the extreme simplicity and clearness of its language, making it appropriate for, and interesting to, the general reader. There are eleven illustrations, most of which are after Howard. C. W.

Chloride of Lime in Sanitation. By Albert H. Hooker, Technical Director, Hooker Electrochemical Company. New York: John Wiley and Sons. 1913.

This work, while written from a commercial point of view, is of distinct value to the student of sanitation. The application of chloride of lime to water purification, street cleaning, and in connection with the handling of infectious diseases, is carefully compiled. A valuable feature of the work is the extensive bibliography, which is not simply a list of titles, but a comprehensive compilation of abstracts and summaries of books and articles on the subject. C. W.

"Verb. Sap." on Going to West Africa, Northern and Southern Nigeria, and to the Coasts. Field, Capt. Alan, F. R. G. S. Bale, Sons & Danielsson, Ltd., 83-91 Great Titchfield Street, Oxford Street, London W. Third Edition, 1913.

This "African Baedeker" in its last edition includes a number of new notes and a special article on the Congo Free State. The chapter on "Health, Climate and Seasons" is brightly written and the advice is, as a rule, of a sound character. Comments by Sir Patrick Manson and Sir Ronald Ross and a list of medicines are appended to the chapter. The work as a whole is both amusing and instructive and should be among the books read on the voyage out to the West Coast and kept by the traveler for frequent reference. C. W.

Digitized by Google

A Laboratory Guide to the Study of Parasitology. Herms, W. B. New York: The Macmillan Company, 1913, xi + 72 pages.

This little guide is excellent in its conception and spirit, although designed for students of biology rather than for medical students. The Helminthology, and (3) Life Histories of Parasites. Under the first course is divided into three parts, viz.: (1) Medical Entomology, (2) head both insects and arachnida are included and three exercises on Protozoa are added. The second part deals with various parasitic worms and the third section discusses the metamorphoses of house fly, mosquito and flea. Altogether, the work should serve admirably as a text for college students in this subject. C. W.

TRANSACTIONS.

Transactions of the American Microscopical Society, Vol. XXII, 2, April, 1913.

This volume contains papers on Japanese Protozoa, on Experimental Amitosis in Plants and on Microbiological Studies on Moulds. The most significant paper to pathologists is that upon Japanese Protozoa, which figures and describes new and rare species which will be interesting to protozoologists and for comparison with forms of medical and sanitary importance. There is also a section devoted to Notes and Reviews. C. W.

REPORT.

Annual Report of the Surgeon General of the Public Health Service of the United States, for the Fiscal Year 1912. Washington: Government Printing Office. 1913.

This report indicates the wide scope of the useful activities of this Service. Among the questions of interest to students of Tropical Medicine are various investigations of Typhus Fever, Pellagra, Hookworm Disease, Leprosy, Cholera, Plague, Malta Fever, Yellow Fever, and other infectious diseases. The value of the Federal Health Service is steadily increasing and the Surgeon General may well be proud of the last year's accomplishments. C. W.

REPRINTS.

Alsberg, C. L., and Black, O. F. (1913) Contributions to the Study of Maize Deterioration. Washington, D. C.: Government Printing Office. U. S. Dept. of Agriculture, Bur. Anim. Inlustry. Bull. 270.

Ayers, S. Henry, and Johnson, Wm. T., Jr. (1913) A Study of the Bacteria which Survive Pasteurization. Washington, D. C.: Government Printing Office. U. S. Dept. of Agriculture, Bur. Anim. Industry. Bull. 161.

Digitized by Google

Bainbridge, Wm. S., M. D. (1913) Fulguration and Thermoradiotherapy and

Russell, W. S., M. D. Diathermy (Nagelschmidt) and Electro- Coagulation (Doyen). Reprinted from the Journal of Advanced Therapeutics, January, 1913, Richmond, Va.

Barnet, Joseph, M. D. A Study of Merorachischisis (Spina Bifida Occulta). Reprinted from The American Journal of Diseases of Children, April, 1913, vol. v, pp, 285-296.

Cole, Lewis Gregory, M. D. Preliminary Report on the Diagnosis of Post-pyloric (Duodenal) Ulcer by means of Serial Radiography. N. Y. Medical Journal, May 10, 1913.

Clowes, G. H. A., M. D., and Bush, F. C., M. D. Treatment of Hemorrhage by Means of Precipitated Blood Sera. N. Y. Medical Journal, January 4, 1913.

Creel, R. H. The Rat: Its Habits and Their Relation to Antiplague Measures. Reprint No. 119, Public Health Reports, February 28, 1913. Washington, D. C.: Government Printing Office.

The burrowing and climbing habits of different rats are emphasized. Swimming abilities are considerable, enabling them to leave a ship and reach the shore half a mile away in smooth water. C. W.

DeDuys, L. R., M. D. A Study of the Wassermann Reaction in Connection with Hereditary Syphilis. American Journal of Diseases of Children, January, 1913, vol. v, pp. 65-69. Chicago: American Medical Association.

Dyer, Isadore, Ph. B., M. D. Some Economic Questions Related to Syphilis. Nashville, Tenn. Southern Medical Journal, January, 1913, pp. 10-13.

Dyer, Isadore, Ph. B., M. D. The Elements of Dermatology. Reprinted from New Orleans Medical and Surgical Journal, January, 1913, vol. lxv.

Flexner, Simon, M. D. The Results of the Serum Treatment in Thirteen Hundred Cases of Epidemic Meningitis. Reprinted from the Journal of Experimental Medicine, vol. xvii, No. 5, 1913.

Goldberger, Joseph. Typhus Fever and Typhoid Fever. Reprint No. 111, Public Health Reports, January 10, 1913. Washington, D. C.: Government Printing Office.

The author emphasizes the fact that typhus fever is endemic in the United States. C. W.

Digitized by Google

Grimm, R. M. Pellagra: A Report on Its Epidemiology. Washington, D. C.: Government Printing Office. Reprint No. 120 from Public Health Reports, March 7-14, 1913.

An interesting paper dealing with the distribution of the disease as affected by race, sex, age and other epidemological factors. The author considers that insect dissemination is not inconssitent with the facts collected by him. C. W.

Hall, Maurice C., M. A., and Muir, James T., M. D. A Critical Study of a Case of Myiasis Due to Eristalis. Reprinted from the Archives of Internal Medicine, February, 1913, vol. xi, pp. 193-203. Chicago: American Medical Association.

The writers record seven published cases of *Eristalis* myiasis in man, to which should be added their own case and four unpublished cases recorded in the files of the Bureau of Entomology in Washington. C. W.

Hillman, O. S., M. D. Some Hematological Findings in Pellagra American Journal of Medical Science, April, 1913, No. 4, vol. cxlv, p. 507

The data are given in detail. The author finds occasional chloranemia, not infrequent leucocytosis and lymphocytosis. C. W.

Hubby, Dr. Lester M. Nystagmus Produced by Galvanism of Individual Semicircular Canals. Reprinted from The Laryngoscope, St. Louis, February, 1913.

Johnston, J. C., A. B., M. D. Speculations as to the Causation of Eczema. Reprinted from The Journal of Cutaneous Diseases, including Syphilis, January, 1913.

Kostmayer, H. W., M. D., and Gelpi, Maurice J., M. D. Developmental Defects of the Female Genitalia: Report of Five Cases. N. O. Medical and Surgical Journal, February, 1913, vol. lxv.

Lavinder, C. H. The Prevalence of Geographic Distribution of Pellagra in the United States. Washington, D. C.: Government Printing Office. Treasury Department, U. S. Public Health Service.

Author considers that within last five or six years pellagra has claimed in the United States not less than 30,000 victims with a fatality of over 39%, and that the disease is continuing its spread over wider territory. C. W.

Post, Abner, M. D. The Proper Places of Mercury and Salvarsan in the Treatment of Syphilis. Reprinted from The Journal of the American Medical Association, vol. lix, No. 14, pp. 1240-1243, October 5, 1912.

Ransom, B. H., Ph. D. The Life History of *Habronema muscae* (Carter), a Parasite of the Horse Transmitted by the House Fly. Wash-

Digitized by Google

ington, D. C.: Government Printing Office. U. S. Dept. of Agriculture, Bur. Anim. Industry, Bull. 163.

A careful and interesting paper, of importance since various stages of this worm found in house flies have at different times been mistaken for human parasites. C. W.

Rucker, W. C. Plague: The Relation Between Traffic and the Spread of Plague. Reprint 114 from Public Health Reports, January 24, 1913. Washington, D. C.: Government Printing Office.

Stress is laid on the economic as well as the sanitary desirability of rat extermination. C. W.

Rupp, Philip, M. D., Ph. D. Chemical Changes Produced in Cows' Milk by Pasteurization. Washington, D. C.: Government Printing Office. U. S. Dept. of Agriculture, Bur. Anim. Industry.

Simpson, French. Rat Proofing: Its Practical Application in the Construction or Repair of Dwellings or Other Buildings. Reprint No. 122, Public Health Reports, April 11, 1913. Washington, D. C.: Government Printing Office.

Careful directions are given. The paper could well form a manual for inspectors in time of plague. C. W.

Sutton, Richard L., M. D. Mycetoma in America. Chicago: Journal of The American Medical Association, May 3, 1913, vol lx, pp. 1339-1342.

The author studied two cases in Kansas City, Mo. Both cases were from Texas, one being a native of Mexico. Photographs and a drawing from a microscopic section are given. C. W.

Walker, Ernest Linwood. Quantitative Determination of the Balantidicidal Activity of Certain Drugs and Chemicals as a Basis for Treatment of Infections with Balantidium Coli. Reprinted from The Philippine Journal of Science, vol. vii, No. 1, Sec. B. Tropical Medicine, February, 1913. Manila: Bureau of Printing.

This is a very careful and excellent paper and reports that arsenical and antimonial compounds, analin dyes, quinin, ipecac and its alkaloid emetin, have little or no balantidicidal action, while the salts of the heavy metals, especially mercury and silver, are eminently balantidicidal. C. W.

Wetherill, H. G., M. D. The Growth, the Death and the Regeneration of Bone. Journal of the American Medical Association, March 29, 1913, vol. lx, pp. 983-990.

Wetherill, H. G., M. D. Successful Transplantation of Graft without Periosteum. Reprinted from The Journal of the American Medical Association, May 17, 1913, vol. lx, pp. 1533-1534.

Digitized by Google

PRINTED AT THE TULANE UNIVERSITY PRESS
NEW ORLEANS, U. S. A.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CREIGHTON WELLMAN, M. D. ..... EDITOR-IN-CHIEF
CHARLES CHASSAIGNAC, M. D. }
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine } *Ex officio*
JOHN M. SWAN, M. D., Secretary, American Society of Tropical Medicine }
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M. D., University of Pennsylvania.
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. AUGUST, 1913 NO. 2.

EDITORIAL

The Commission of the Southern Medical Association for the Study and Prevention of Malaria.—This commission, appointed during the summer of 1912, has collected valuable data regarding malaria in the southern United States, which data are presented in a preliminary report recently published.* In answer to a *questionnaire* sent to health officers and physicians, statistics and opinions have been received from 263 counties in 15 states. Of these 263 counties, 155 are stated to be malarial, while 108 are said to be free from the disease. The number of cases per 1000 of population ranges from 800 to 25 or less. In 86 counties the ratio between present and past prevalence is said to be less than formerly, in 25 the ratio was reported the same, and in 16 it was stated to be increasing. In 105 counties the pernicious forms of malaria occur, the death rate vary-

*Southern Medical Journal, April 1, 1913, pp. 219-226.

Digitized by Google

ing from 40% to 0.2%. In all but 3 of the 155 counties where malaria prevails the season of greatest prevalence is reported to be the summer and autumn, tertian infections being commonest in summer and aestivo-autumnal in fall. The tertian parasite is reported from 145 counties, the aestivo-autumnal fromm 108 and the quartan from 46. In most of the counties the ratio of malignant to non-malignant types is given as about 1%, but in some counties this reaches 10%, and in two counties as high as 15%.

Anopheles mosquitoes are reported as being the most numerous in the autumn. The statistics regarding screening of houses show that probably not over 5% of the houses are well screened in the endemic area. Of the 155 counties reporting malaria, prophylactic measures against the disease are employed in 88. These measures comprise drainage, mosquito destruction, including treatment of breeding places, screening of houses and patients, quinine prophylaxis, public instruction and diagnosis and treatment of latent infections. The report closes with an interesting summary which shows that in the endemic area the annual number of cases is 565,600, the deaths 5656, and the economic loss from the disease $16,868,000.

A careful study of this detailed report emphasizes the magnitude of the malarial problem in the United States, and it is to be hoped that an adequate sum of money may be made available by national legislation or private benefaction, so that the most fertile region of our country may be made habitable. A movement directed toward the eradication of malaria, similar to that already established against hookworm disease, would, if adequately financed, be productive of the most beneficial results.

Creighton Wellman.

Honor to Dr. Bass.—The American Medical Association has awarded its gold medal to Professor Charles Cassedy Bass,

Digitized by Google

of the Tulane School of Hygiene and Tropical Medicine, for an exhibit of his researches upon the cultivation of the malarial plasmodia, shown at the Minneapolis meeting of the Association in June of this year. This is the third honor of the kind that has come to Dr. Bass, gold medals having previously been awarded him by the Southern Medical Association and the Mississippi Valley Medical Society.

Confirmation of the researches of Dr. Bass have come from Ziemann, Thompson, and other noted authorities upon malaria, and the work already accomplished along this line leads to the hope that the cultivation of the plasmodia will throw much light upon many little understood aspects of the parasitology of the malarial fevers.

The AMERICAN JOURNAL OF TROPICAL DISEASES felicitates Dr. Bass, and his colleague in the investigation, Dr. Johns, and congratulates the Tulane School of Tropical Medicine upon the brilliant results of its first scientific expedition to the Tropics.

Charles F. Craig.

The Etiology of Beri-Beri.—The contention of Scheube,[1] Wright,[2] Davis,[3] Bréaudat[4] and others, that beri-beri is due to bacterial infection, seems to have been overshadowed by the work of a number of observers who, by their experiments on animals and man, have drawn attention to the rôle of diatetic factors in the causation of the disease.

The early experiments of Schaumann[5] led him to the conclusion that there is some similarity between scurvy and beriberi, due possibly to calcium and magnesium metabolism. He

1. Die Krankheiten der warmen Laender, Jena, Gustav Fischer, 1910.
2. Studies from the Institute for Medical Research, Federated Malay States, vol. ii, No. 1.
3. Transactions of the Far Eastern Association of Tropical Medicine. Congress of 1912.
4. *Ibid.*
5. Archiv für Schiffs-und Tropenhygiene, Bd. 16, 1, pp. 137-170.

Digitized by Google

later[6] brought out the idea that the phosphorus-containing body in rice polishings was the preventive and curative substance. Still later[7] he reached the conclusion, already arrived at before by Funk,[8] that there is a crystallizable substance contained in the rice polishings which causes a disappearance of the symptoms. He concludes that this substance acts as an activator or catylisator in mobilization of phosphorus and possibly is an important adjunct to plant metabolism.[9] This substance may be a betain derivative of trimethylamine. The change in the attitude toward the rôle which phosphorus plays is noticeable. The author now considers the activator of primary importance in the metabolism, which is evinced by an immediate increase in the appetite of the experimental animals. Terruchi[10] has also shown that the active principle of polishings is due to something else than phosphorus compounds, and concludes that relative phosphorus content has no etiological bearing whatever. Fraser and Stanton[11] believe that the preventive substances are neither proteins nor glucosides. Suzuki and Shimammuri [12] isolated a substance which does not contain phosphorus at all and called by them aberinic acid. Vedder[13] found that arginin and histidin were not active. Shiga and Kasuma [14] showed that heating the grain to 130° in the autoclave destroyed the preventive agent. The substance extracted by alcohol was shown to contain little nitrogen and no phosphorus. They consider that the disease is caused by a certain substance necessary to metabolism, in the

6. *Ibid.*, Heft ii.
7. *Ibid.*, Bd. 15, Heft 22, 1911.
8. Journal of Physiology, 1911, vol. xliii, No. 5.
9. Cf. Stanek Zeits. f. Physiol. Chemie, 1911, Bd. 72, p. 402.
10. Transactions of the Far Eastern Association of Tropical Medicine, Congress of 1912.
11. Studies from the Institute of Medical Research, Federated Malay States, No. 12, 1911.
12. Journal of the Tokio Chemical Society, vol. xxxii, i-iv, 1911.
13. Transactions of the Far Eastern Association of Tropical Medicine, Congress of 1912.
14. Archiv für Schiff-und Tropenhygiene, 1911, Beiheft 3.

Digitized by Google

grain. Chamberlain and Vedder[15] found in neuritis-producing rice both the phosphorus and potassium markedly reduced and consider that the potassium reduction is probably as reliable an index to the degree of polishing as the phosphorus reduction. Fraser and Stanton[16] again showed that at least one-half the nitrogen originally present in their extract must have been present in some other form than protein. They also proved that the substance belongs to the crystalloids. Chamberlain, Vedder and Williams[17] thought that some non-nitrogen, which is present, like arginin, asparagin, etc., might be the neuritis-preventing substance. Fraser and Stanton[18] further consider that sucrose is of no importance. They also exclude nucleins from the substance curing polyneuritis. These last authors found fats to be of no value as protective substances, and mention prolamin (alcohol soluble protein) which is contained in the fraction including the protective substance.

Funk[19] has occupied himself with the isolation of the protective substance from rice pericarp and has described a "vitamine" which is crystalloid and a base and has also pointed out that a number of purin and pyramidin substances possess the power of replacing some of the physiological functions of this vitamine. Quite recently Funk has carefully studied the "vitamine fraction" in substances other than rice bran, e. g., milk,[20] yeast,[21] etc.

The recent work of Cooper[22] on the protective and curative substances in different foodstuffs is of interest, and the experi-

15. Bulletin of the Manila Medical Society, February, 1912.
16. Lancet, Dec. 17, 1910.
17. Philippine Journal of Science, vol. vii, 1, Section B, February, 1912.
18. Studies from the Institute of Medical Research, Federated Malay States, No. 12.
19. Journal of State Medicine, June, 1912, 20, pp. 341 ff. Also Journal of Physiology, February, 1913, vol xlv, p. 489 f.
20. Biochemical Journal, March, 1913, vii, 2, p. 211 f.
21. British Medical Journal, April, 1913, p. 814.
22. Journal of Hygiene, 1912, vol. xii, 4, p. 436 f.

Digitized by Google

ments of the writer and his colleagues[23] producing the polyneuritis in birds by feeding a number of substances, other than rice, may be also mentioned.

It is to be hoped, in view of the interest and activity in the attack on this great problem, that its solution will not be long delayed. *Creighton Wellman.*

23. New Orleans Medical and Surgical Journal, September, 1912, vol. xv, 3, p. 197 f. Also Southern Medical Journal. See also article in the present issue of this JOURNAL.

Digitized by Google

ORIGINAL ARTICLES

FURTHER EXPERIENCES WITH BERI-BERI IN THE PHILIPPINE ISLANDS.*

By VICTOR G. HEISER, M. D.,
Chief Health Officer of the Philippine Islands, Manila, Philippine Islands.

Within the past year much additional laboratory proof has been adduced to support the hypothesis that beri-beri in human beings is intimately associated with the consumption of decorticated or polished rice as a staple article of diet. In fact, the evidence is now so abundant that there can be small doubt of the correctness of the view. Yet it may not be amiss to make of record actual additional experiences that have been had with outbreaks of this disease among persons. It may be, perhaps, remembered that before the use of unpolished rice was begun among the inmates of the Culion Leper Colony the deaths among less than 2000 persons were approximately 100 per month, the large majority of which were due to beri-beri, but after the undecorticated or unpolished rice was introduced the number of deaths fell to from 15 to 20 per month and there were no further deaths from beri-beri. During the autumn of 1911 there was a great shortage in rice throughout the Orient and this led to a considerable amount of speculation which had for its object the controlling of all of the available rice. The price was advanced, in some instances 100% or more. The Philippine government, in order to protect the people of the Philippines as much as possible from extortionate prices, attempted to break the corner in rice, and in order to bring this about, bought large quantities of rice. The plan was successful and in a short time the price was reduced to a more normal figure. Unfortunately, however, the condition of the market was such that polished rice had to be accepted, so that the government found itself with large quantities of this variety on hand. In order to dispose of it large issues were made to the Culion Leper Colony during November, 1911. During January cases of beri-beri began to

*Read by title at the Tenth Annual Meeting of the American Society of Tropical Medicine, held at Washington, May 6, 7 and 8, 1913.

Digitized by Google

make their appearance among the inmates and the mortality rate again soon reached 86 per month. During the early part of February the use of unpolished rice was resumed, and there was an immediate reduction in the number of new cases of beri-beri. The following table illustrates in a more graphic manner the number of deaths from this disease during the months covered by this report.

1912.	Total Deaths.	Deaths from Beri-beri.
January	35	2
February	86	36
March	82	60
April	25	3
May	29	6*
June	38	2*
July	22	1*

It will be noted that after April the disease again entirely disappeared, and there have been no further cases up to the present time. In a previous paper published in the Journal of the American Medical Association evidence was presented which showed that after the disease had prevailed in epidemic form in an uninterrupted manner at the Culion Leper Colony for a number of years, it ceased when the use of unpolished rice was made obligatory. The foregoing facts show that after an absence of over two years it again made its appearance when the use of polished rice was begun. In other words, the disease which formerly prevailed there was stopped by the use of unpolished rice; that is, a rice which contains at least 0.4 of 1% of phosphorus pentoxide; and reappeared when the use of polished rice was again begun, that is, a rice which contained only 0.2% of phosphorus pentoxide or less. Attention is again drawn to the fact, however, that the amount of phosphorus pentoxide is believed to be of importance only as an index as to the amount of the outer layer or pericarp of the rice grain that has been removed. The identity of the substance which exists in the polishings, the lack of which causes beri-beri, has not yet been satisfactorily determined.

*NOTE.—Cases admitted to the colony suffering from beri-beri.

Digitized by Google

THE CHARACTER OF THE RICE WHICH PREVENTS BERI-BERI AND THE MANNER IN WHICH IT IS MILLED.*

MAJOR WESTON P. CHAMBERLAIN, M. D.,
Medical Corps, U. S. Army, Plattsburg Barracks, N. Y.

When a fowl has subsisted exclusively on the ordinary commercial rice sold in the United States it will become paralyzed in the legs after a period of about thirty days. This condition is the so-called *Polyneuritis gallinarum,* which is a degenerative process, generally most manifest in the motor neurons of the legs, though it occasionally affects to a marked degree the pneumogastric nerve, causing cardiac and pulmonary symptoms. The degeneration is undoubtedly due to the absence from the diet of some substance essential to nerve nutrition.[1 2 3 4 37]

If a man is fed on a diet consisting chiefly of the same kind of rice he will develop beri-beri after a lapse of about ninety days. The symptoms manifested will closely resemble those seen in the fowl, and the lesions in the nerves are identical. The similarity in the etiology, in the pathology, and in the symptomology of the two conditions leaves little room for doubt that beri-beri and *Polyneuritis gallinarum* are identical. [2 6 7 24 37 42]

If a mother eating this same kind of diet gives birth to a child, and continues to suckle it, the infant in a large number of instances will develop a disease which is extremely common in the Philippines under the native name of *taon,* and which is believed to be infantile beri-beri. This malady is generally fatal if nursing is continued, but recovery is nearly always prompt when the child is fed on canned milk or on fresh cow's milk. The mother may or may not show signs of beri-beri.[8 9 10 11 12 13 15 16 23]

Instead of using the commercial snowy-white article familiar to us in the United States we may employ a grade of rice having

*Read with permission of the Surgeon General, United States Army, at the Tenth Annual Meeting of the American Society of Tropical Medicine, held at Washington, May 6, 7 and 8, 1913.

Digitized by Google

a part of the inner skin, or pericarp, left on the kernel. Subsisting on such a grain, the chicken and the man remain well. If to the chicken, which is being fed on the snowy-white commercial rice, there be administered a daily dose of the pulverized skin which has been milled off its rice, then the fowl remains in perfect health indefinitely. An extract of this skin produces like results. If the baby with infantile beri-beri is given this same extract of rice polishings, while continuing to be nursed by the mother, its recovery is as prompt and marvelous as that seen when fruit juice is administered for infantile scorbutus.[1 3 4 5 6 15 23 37 38]

The use of this rice with the skin or pericarp remaining on the kernel has led to a great reduction or to a complete disappearance of beri-beri in many places in the Orient where it has been tried.* [17 19 20 21 22 31]

In view of the above facts it becomes important for the tropical practitioner to have some knowledge of rice and its preparation for the market, so I will briefly touch on the matter before passing around my samples of the grain. The methods of milling described are those practiced in one of the largest of the English mills in the Philippines.

The endosperm of rice consists almost entirely of starch granules except for a thin outer portion, termed the *aleurone layer*, which contains the albuminous material of the seed together with most of the fat. Outside of the aleurone layer, and

*It should be stated that all authorities do not accept the polished rice theory of beri-beri production. As a result of clinical and experimental evidence obtained in the Philippines I am, personally, fully convinced of the correctness of the theory as regards the beri-beri commonly seen in the Orient. In some instances, particularly on ships and in Brazil, [25 33] a disease called beri-beri is reported as occurring among persons who eat little or no rice. Three explanations of these facts may be offered: Firstly, the dietary may be an unbalanced one, lacking the neuritis-preventing substance, even though it is not a rice diet.[40] Secondly, the neuritis-preventing principle may have been destroyed by excessive heat, as for instance by cooking with steam under pressure. Thirdly, the term beri-beri may include several varieties of neuritis caused by different factors. Neuritis due to poisons, such as lead, arsenic and alcohol, and to toxins produced by bacteria, such as the Klebs-Loeffler bacillus, are well known. That a diet of rice deprived of its pericarp will produce neuritis seems fully established. But it by no means follows that there may not be still other types of endemic tropical neuritis, the causes of which remain undetermined.

Digitized by Google

adhering to it, is the "*inner skin*" or *pericarp*. The color of the pericarp varies in different species of rice from white to nearly black. In the Philippines it is usually yellowish-white or red. Outside the pericarp is the grayish *husk* or "*outer skin.*" Rice with the husk still on is called by the English *padi*, and in the Philippines *palay*. The husk can readily be taken off without damaging the pericarp, but when the pericarp is removed more or less of the aleurone layer comes off with it, and in very complete milling practically nothing is left of the kernel except a lump of starch.[24]

Palay is husked between large horizontal revolving disks of artificial stone. The disks are separated by a distance about equal to the length of a rice grain. The chaff is winnowed out and the husked grains are separated as far as possible from the unhusked by screening. At this stage little or none of the pericarp has been chipped off and the rice as it comes from the screen is called in Tagalog *pinaoa* or *pinawa*. This grain will prevent beri-beri, but has rather too much pericarp left on it to be an attractive article of diet.

The next process, called "*milling,*" is carried out by means of a revolving artificial stone cone, standing vertically. Around it is a close-fitting metal-gauze case. Friction between the cone and the case rubs off the pericarp and the aleurone layer, the degree of removal depending upon the distance between stone and netting, the speed of revolution, and the time spent in the process. The dust escaping through the net consists of pulverized pericarp and aleurone, with some starch. It is spoken of as *rice-polishings*, or in the Philippines as *tiqui-tiqui*, and it contains a neuritis-preventing substance which can be extracted by water or alcohol. In highly milled white rices, like thoses universally seen in the United States,* and very commonly in the Orient, all of the pericarp, and all or most of the aleurone layer, has been removed, leaving only a grain of starch behind.

The last process of treatment in the rice mill is the "*polishing,*" which is carried out between a fixed wire screen and a conical buffer, revolving on a vertical axis and covered with

*I am informed that an undermilled rice can be obtained from S. S. Pierce & Co., Boston, under the name of "natural yellow rice."[43]

Digitized by Google

long-wooled sheepskin. This process is not applied to all rices. It cleans off the adherent *tiqui-tiqui* dust from the grain, but does not remove any appreciable amount of pericarp which may have been left when the preceding process of milling has been carried out only to a limited degree. The polishing process may, therefore, be applied to undermilled rice without depriving it of pericarp, and will tend to free it from adherent *tiqui-tiqui* dust which probably makes the grain more susceptible to the development of weevils.

At various stages in the process of preparation the rice is winnowed and screened to remove dirt, dust and broken grains, the commercial grade depending in part upon the thoroughness of these steps, and in part upon the original quality of the *palay*. In the United States we find only superior grades of highly milled rice, but in the Philippines many qualities of rice are on the market, the cheaper ones containing numerous broken and unhusked kernels as well as dirt and dust.

As stated above, many of the Philippine rices have a red pericarp, but if this is completely removed by thorough milling the product is as white as if a kernel with a light-colored pericarp had been treated in the same way.

In discussing the etiology of beri-beri many terms have been employed in a somewhat confusing manner to describe the rices experimented with. "Polished rice," "highly milled rice," "scoured rice," "white rice," "uncured rice," "steam-mill rice," and "machine rice" have been used by various writers as synonyms for rice deprived of practically all of its pericarp and aleurone layer. The use of the term "white rice" in this sense is objectionable in that it may lead to confusion between color of pericarp and completeness of the milling process. "Polished rice" or "highly milled rice" are the most satisfactory terms to employ.

"Undermilled rice," "medium milled rice," "cured rice," "red rice," "hand-pounded rice," and "whole rice" are terms which have been applied to rices with a considerable part of the pericarp and aleurone layer left adherent to the kernel. If sufficient of these two layers remains the rice will not cause neuritis when used as an exclusive article of diet for men or fowls. If

Digitized by Google

the pericarp is red the grain will show various shades from brick red to pink, depending on the amount of that layer which has been removed. Rice with yellowish-white pericarp which has been undermilled can be seen on careful inspection to be rougher and less pearly white than the highly milled grade. When an undermilled rice is stained with Gram's iodine solution, and then washed and dried, the pericarp will be observed to be grayish, while the parts denuded of pericarp will be of a deep blue or black color. Highly milled rice will be stained a very dark blue throughout.

As far as presence of adherent pericarp is concerned, undermilled rice corresponds with the "cured rice" of India.[24] Cured rice has been parboiled or steamed before milling, with the result that the pericarp is less easily removed from the kernel. Cured rice is never eaten by the Filipinos, nor, I believe, by the Chinese or Japanese. The Tamils in India make use of it and are said to be free from beri-beri.[24]

In the more isolated sections of the Orient much of the *padi* is still pounded out by hand in large wooden mortars. Unless the process is pushed beyond the usual limit a large part of the pericarp is left on the grain, and it is claimed that natives using such hand-pounded rice do not develop beri-beri.[20] [21]

From what has been said above it appears obvious that highly milled rice lacks some substance which is necessary for nerve nutrition, and that this substance is contained in the polishings produced during the process of milling. Only a very small amount of the neuritis-preventing principle is necessary to maintain health. The same or a similar neuritis-preventing substance appears to be present in relatively large amounts in many articles of diet, such as egg-yolk, barley, peas, beans, and *Phaseolus radiatus* (the *katjang idjo* of the Dutch and the *mongo* of the Philippines). It is also believed to be present in yeast. This element, so essential for nerve nutrition, is destroyed by a temperature of 120° C., and also by prolonged boiling. Therefore, a safe undermilled rice may be rendered beri-beri-producing if cooked by steam under pressure.[18] [22] [23] [26] [29] [34] [35] [37] [41]

The exact chemical nature of the neuritis-preventing substance has probably not yet been determined, though a vast

Digitized by Google

amount of labor has been expended in efforts to isolate it. Schaumann considered that it was a phosphorus compound, but it has been proven beyond reasonable doubt that this supposition is not correct.[5 27 36 39] A large number of substances have been shown by ourselves to be of no value in the prevention of that form of polyneuritis which is seen among fowls.* [4 5 6 26 32] There is considerable reason to believe that this important principle is an organic base, as claimed by Funk.[28] The identification of the neuritis-preventing element is of much scientific interest, but the practical sanitary problem was solved when it was found that undermilled rice would prevent beri-beri. All that remains is for the proper governmental authorities to compel the use among Orientals of a suitable undermilled rice. This can be accomplished by placing proper restrictions on the importation and milling of rice. However, it may be mentioned in passing that such a step is attended with some practical difficulties because of the ignorance and prejudice of native populations.[20] It can probably be effected more easily in the Philippines than in any other Oriental country. When undermilled rice was first introduced into the native army and the civil institutions in the Philippines there was much opposition to its use because the product was less carefully cleaned than polished rice, and because it contained many red grains which rendered it unsightly. At the present time the undermilled rice purchased for the army is prepared from *padi* with white pericarp, and is carefully screened and winnowed. Though not as snowy-white as polished rice, it is by no means unattractive in appearance, and it has a pleasant, slightly nutty flavor, being less insipid than the highly milled grain. This grade has given rise to no dissatisfaction among the Philippine Scouts.[31]

It remains to decide on a standard of milling to which a beri-beri-preventing rice should conform. For some time it has been considered that a rice containing 0.4% of phosphorus pentoxide was a safe article of diet for Oriental peoples. Recently

---

The work in question was inaugurated by me while in Manila as President of the Board for the Study of Tropical Diseases as they Exist in the Philippine Islands. Since my departure from Manila the search for the neuritis-preventing principle has been prosecuted by Capt. E. B. Vedder, Medical Corps, U. S. A.

Digitized by Google

Strong[7] has suggested that this is perhaps a shade too low, and doubtless 0.5% of phosphorus would be a safer standard. There is no difficulty in producing a satisfactory rice containing over 0.5% of phosphorus pentoxide. When the phosphorus content is adopted as a basis for classifying rices it does not follow that one accepts Schaumann's view that a phosphorus compound prevents multiple neuritis. It has been found that most of the phosphorus is contained in the pericarp of the kernel. Consequently, the determination of the phosphorus content of the rice indicates the amount of pericarp left on the grain, and so gives a chemical method of estimating the degree of milling. The determination of any other element which was chiefly contained in the pericarp, such as potassium, would be an equally good index of the safety of a rice.[4] [30] For practical purposes I believe that, after a little experience, the safety of a rice can readily be determined by mere inspection of the grain, either in its natural state or after staining with methylene blue or with Gram's iodine solution in the manner above described.

References.

1. Eijkman, C. Polyneuritis bij Hoenders, Joarverslag van Lab. v. Path. Anat. en Balat., Batavia, 1896.

2. Fraser, H., and Stanton, A. T. The Lancet, 1909, i, p. 451, and 1909, ii, p. 406.

3. Fraser, H., and Stanton, A. T. Etiology of Beri-beri, Studies from the Institute for Medical Research, Federated Malay States, Kuala Lumpur, 1909, No. 10.

4. Chamberlain, W. P., Bloombergh, H. D., and Kilbourne, E. D. Study of Influence of Rice Diet and of Inanition on Production of Multiple Neuritis of Fowls. Phil. Jour. Sci., Sec. B, 1911, iii, p. 177.

5. Chamberlain, W. P., and Vedder, E. B. Contribution to Etiology of Beri-beri. Phil. Jour. Sci., Sec. B, 1911, iii, p. 251.

6. Chamberlain, W. P., and Vedder, E. B. Second Contribution to Etiology of Beri-beri. Phil. Jour. Sci., Sec. B, 1911, v, p. 395.

7. Strong, R. P., and Crowell, B. C. Etiology of Beri-beri. Phil. Jour. Sci., Sec. B, 1912, iv, p. 271.

8. José, Albert. Case of Infantile Beri-beri with Autopsy Report. Phil. Jour. Sci., Sec. B, 1908, iv, p. 345.

9. Guerrero and Quintos. El Beri-beri en los Niños de Pecho, Manila, 1910.

10. McLaughlin, A. J., and Andrews, V. L. Studies on Infant Mortality. Phil. Jour. Sci., Sec. B, 1910, ii, p. 149.

11. Hirota, Z. Über die durch die Milch der an Kakke leidenden Frauen verursachte Krankheiten der Sauglinge. Central. f. inner. Med., 1898, p. 385.

12. Albert, J. La Mortalidad Infantil de Filipinas comparada con la Mortalidad Infantil de Europa y de los Estados Unidos, Bul. Manila Med. Soc., 1910, p. 11.

13. Calderon, F. G. The Taon (Infantile Beri-beri) Treated at La Gota de Leche, Bul. Manila Med. Soc., 1911, p. 8.

Digitized by Google

14. Andrews, V. L. Infantile Beri-beri. Phil. Jour. Sci., Sec. B, 1912, ii, p. 67.

15. Chamberlain, W. P., and Vedder, E. B. Cure of Infantile Beri-beri by an Extract of Rice Polishings. Bul. Manila Med. Soc., 1912, February 1.

16. McLaughlin, A. J. Beri-beri in Infants, Jour. Trop. Med. and Hyg., 1912, xxiv, p. 370.

17. Heiser, V. G. Phil. Jour. Sci., Sec. B, 1911, vi, p. 229.

18. Chamberlain, W. P. The Disappearance of Beri-beri from the Philippine (Native) Scouts. Military Surgeon, 1911, xxviii, p. 509.

19. Heiser, V. G. Second Quarterly Report. P. I. Bur. Health, 1910.

20. Heiser, V. G. Practical Experiences with Beri-beri and Unpolished Rice in the Philippines. Jour. Am. Med. Assoc., 1911, lvi, p. 1237.

21. Highet, G. H. Phil. Jour. Sci., Sec. B, 1910, v, p. 73.

22. Chamberlain, W. P., and Vedder, E., B. Report of Board for Study of Tropical Diseases. Military Surgeon, 1912, xxxi, p. 176.

23. Chamberlain, W. P. Tropical Diseases in the Philippine Islands. Jour. Am. Med. Assoc., 1912, lviii, p. 998.

24. Braddon, W. L. The Cause and Prevention of Beri-beri. London, 1907.

25. Lovelace, C. Etiology of Beri-beri. Jour. Am. Med. Assoc., 1912, lix, 2134.

26. Vedder, E. B. A Fourth Contribution to the Etiology of Beri-beri. Phil. Jour. Sci., Sec. B, 1912, iv, 415.

27. Schaumann, H. Die Aetiologie der Beri-beri unter Beruksichtigung des gesamten Phosphorstoffwechsels. Arch. f. Schiffs-u. Trop., 1910, xiv, Beihefte, p.-8.

28. Funk. Chemical Nature of the Substance which Cures Polyneuritis of Birds Induced by a Diet of Polished Rice. Jour. Physiol., 1911, xliii, No. 5.

29. Chamberlain, W. P. Eradication of Beri-beri from the Philippine (Native) Scouts by Means of Simple Changes in Their Dietary. Phil. Jour. Sci., Sec. B, 1911, ii.

30. Kilbourne, E. D. Food Salts in Relation to Beri-beri. Phil. Jour. Sci., Sec. B., 1910, v, p. 127.

31. Chamberlain, W. P., Vedder, E. B., and Barber, J. R. Report of Board for Study of Tropical Diseases. Military Surgeon, 1912, xxx, pp. 312 and 6,675.

32. Chamberlain, W. P., Vedder, E. B., and Williams, R. R. Third Contribution to Study of Beri-beri. Phil. Jour. Sci., Sec. B., 1912, i, 39.

33. Smith, F., and Hastings, A. G. F. Multiple Neuritis among Soldiers in Calcutta and Vicinity. Jour. R. A. M. C., 1913, xx, p. 202.

34. Cooper, E. A. Protective and Curative Properties of Certain Foodstuffs Against Polyneuritis Induced in Birds by a Diet of Polished Rice. Jour of Hyg., 1913, iv, p. 436.

35. Moore and Co-workers. Anti-neuritic Bases of Vegetable Origin in Relationship to Beri-beri, with Method of Isolation of Torulin, the Anti-neuritic Base of Yeast. Biochem. Jour., 1911, vi, p. 234.

36. Simpson and Edie. Relations of Organic Phosphorus Content of Various Diets to Diseases of Nutrition, Particularly Beri-beri. Ann. Trop. Med. and Parasitol., 1911, v, p. 313.

37. Grijns. Med. Lab. Anal. Weltwerden, 1900; Geneestijds. v. Ned. Ind., 1900, 41; *Ibid.*, 1909, 49.

38. Fletcher. Rice and Beri-beri. Lancet, 1907, i, p. 1777.

39. Cooper and Funk. Experiments on the Causation of Beri-beri. Lancet, 1911, ii, p. 1266.

40. Little. Beri-beri Caused by Fine Wheat Flour. Jour. Am. Med. Asso., 1912, lviii, p. 2029.

41. Funk. Preparation from Yeast and Certain Foodstuffs of the Substance the Deficiency of Which in Diet Occasions Polyneuritis in Birds. Jour. Phys., 1912, xlv, p. 75.

42. Vedder, E. B., and Clark, E. A Study of *Polyneuritis gallinarum*. Phil. Jour. Sci., Sec. B, 1912, v, p. 423.

43. Packard, H. Polished Rice. vs. Unpolished Rice. Boston Med. and Surg. Jour., 1913, xii, p. 447.

ERRATUM.—In article shown in reference 28 Table VI for month of December should show 0 admissions instead of 10.

Digitized by Google

POLYNEURITIS GALLINARUM CAUSED BY DIFFERENT FOODSTUFFS.*

With Special Reference to the Effect of Commercial Rice Coating on Neuritis Production.

By

CREIGHTON WELLMAN, M. D.,
Professor of Tropical Medicine and Dean of the Tulane School of Hygiene and Tropical Medicine,

and

C. C. BASS, M. D.,
Professor of Experimental Medicine in the Tulane School of Hygiene and Tropical Medicine.

The investigations herein described were undertaken with two objects in view: To determine what common articles of diet other than rice will give rise to polyneuritis in fowls when they are fed these foods as an exclusive diet, and to ascertain whether the glucose and talc on the commercial "polished" rice, and milled in local mills, is the cause of the polyneuritis which develops in fowls when they are fed on this variety of rice as an exclusive diet.

The process of rice milling in the local mills does not differ materiall from that employed in all the large mills of the world. First, the husk or chaff is separated from the grain, after which a considerable portion of the outer layer, the pericarp, rich in protein, is removed. This last named is known, respectively, as rice bran or polish, according to the amount removed, and finds a ready sale as stock food. The once brown or red grain is now white and consists chiefly of starch—this is the milled rice. The milled product is now run through a large revolving drum, into which is fed a certain amount of glucose and talc. As a result of this operation the rice receives a thin coating of glucose and talc, which imparts to the grain a polished appearance. This is the commercial rice—the rice which is ordinarily sold as food.

---

*Read at the Tenth Annual Meeting of the American Society of Tropical Medicine, held at Washington, May 6, 7, and 8, 1913.

Digitized by Google

The reason advanced for the coating of rice with glucose and talc is that by the exclusion of air the grain is kept from deteriorating, and unless rice is so treated it would quickly gather mould and prove a favorable place for the hatching of worm eggs. In damp countries the coating of rice is said to be absolutely essential, and that if not done the grain will last but a short period of time. The amount of glucose and talc on the ordinary commercial "polished" rice exhibits great variation with different samples of rice; no two mills use the same amount. The amount of glucose and talc used is regulated by the sense of touch, and not by any standards of weight or measure. It is said that certain lots of rice require more of these substances to give them the desired glossy appearance and smooth feeling than do others.

For the purpose of determining approximately the average amount of these substances used on the rice we carefully compared the average output of "polished" rice and the amount of glucose and talc used by two of the largest mills in New Orleans. We concluded that the amount of glucose coated on rice seldom, if ever, exceeds one part by weight in eight hundred parts of the finished product. The amount of talc used is about one-half as much as the glucose, or one part in sixteen hundred.

To find out the amount of these substances that could be eaten by fowls living on "polished" rice only, we weighed 36 fowls and fed them all the "polished" rice they would eat for a period of five days. They were confined in wire cages and not given any other food. The rice was fed in specially devised hoppers which prevented any waste. This experiment indicated that the average daily consumption of "polished" rice when fed exclusively and *ad libitum* was approximately 47.37 gm. per kg. of live weight. Our estimate of the maximum amount of glucose and talc on "polished" rice would, as a result of this experiment, indicate that the maximum daily consumption of glucose by a fowl fed exclusively on "polished" rice would be about 0.0625 gm. per kg. The grown-up chickens used in this experimental work weighed from 1 to 3 kg. A chicken, therefore, would consume about 0.125 gm. of glucose per day. The amount of talc on "polished" rice being about one-half that

Digitized by Google

of the glucose, the fowl would consume about 0.03825 gm. per kg. or 0.0625 gm. per fowl, per day.

Experiment No. 24.

Three grown fowls running free in a large yard and fed corn and wheat were each given daily by means of a tube two grammes of glucose for fifty-three consecutive days. They remained perfectly healthy.

From this experiment it is evident that glucose does not produce polyneuritis in fowls living on a mixed diet when the glucose is approximately sixteen times as great an amount as would be eaten on an exclusive "polished" rice diet.

Experiment No. 27.

Three grown fowls that had lived on an exclusive diet of whole wheat for 83 days, and were pulling feathers badly, but otherwise healthy, were fed for 53 days on whole wheat over which a large amount of glucose was poured. The whole wheat was covered with glucose and the chickens were forced to consume at least 100 times as much glucose as they would eat if they were living on an exclusive diet of "polished" rice. They continued normal, but appeared quite ragged from feather pulling due to a single grain diet.

One would naturally conclude from this that approximately 100 times the amount of glucose that would be consumed on an exclusive "polished" rice diet does not produce polyneuritis in fowls living on a diet of whole wheat exclusively.

Experiment No. 29.

Three grown fowls that had subsisted on an exclusive diet of whole wheat for 83 days were fed for 53 days brown rice over which a large amount of glucose was poured. The rice was covered with pure glucose and the chickens were thus forced to eat 100 times as much glucose as they would receive ordinarily on an exclusive diet of polished rice. Despite this they maintained their health and did not lose weight, but were, more or less. tattered from feather pulling due to a single grain diet.

This experiment is, to our mind, sufficient justification for the belief that 100 times the amount of glucose that would be

Digitized by Google

eaten on an exclusive "polished" rice diet does not produce polyneuritis in fowls living on a diet of brown rice.

Similar experiments were made to determine whether talc would produce polyneuritis when fed in comparatively large quantities.

Experiment No. 26.

Three grown fowls were allowed to run in a large open yard and were fed liberally whole wheat and corn. They were given daily by means of a tube 1 gramme of talc for 53 days. Their health was not in the least impaired by the experiment.

This experiment indicates that talc does not produce polyneuritis when given in amounts about sixteen times the amount that would be eaten on an exclusive diet of "polished" rice, to chickens on general diet and enjoying the range of a yard.

Experiment No. 28.

Three chickens that had been fed whole wheat for 83 days and were pulling the feathers of each other badly were continued on a diet of whole wheat. With the wheat was mixed about 1/20 its weight of talc, and the chickens were thus compelled to eat more than one-hundred times as much as they would have eaten on a diet of "polished" rice.

This experiment was continued 53 days. On the fourteenth day one of the chickens was found dead with its intestines exposed through a large hole picked through the abdominal wall. It was very fat. On the forty-seventh day another died in very much the same manner. The other one remained well. (Fig. 23.)

This alone is significant that talc does not produce polyneuritis in fowls that are living on a diet of wheat when fed in an amount of over 100 times as great as would be eaten if they were living on an exclusive diet of "polished" rice.

Experiment No. 30.

Three chickens that had lived on an exclusive whole wheat diet were put on an exclusive diet of brown rice, with which was mixed one-twentieth its weight of talc. The wheat was covered with the talc and the chickens were obliged to eat more than 100 times as much talc as they would have eaten if they

Digitized by Google

were subsisting on an exclusive diet of "polished" rice. The experiment was continued for 53 days and all fowls remained healthy.

This experiment is proof that talc does not produce polyneuritis in fowls living on a diet of brown rice, when eaten in an amount over 100 times as great as would be eaten on an exclusive diet of "polished" rice.

These last six experiments indicate very plainly that neither glucose nor talc will produce polyneuritis in fowls when eaten in much greater amounts than would be eaten on an exclusive "polished" rice diet, but they do leave open the question of the possibility that the two substances together may cause it. Other experiments bearing directly upon this point were made.

Experiment No. 25.

Three grown chickens running in the yard and given general mixed diet were fed once a day by means of a tube 2 grammes of glucose and 1 gramme of talc. On the third day one chicken, which the previous day had appeared well, was found dead. Autopsy revealed multiple grayish spots in the liver, but no other abnormal features. On the forty-sixth day another chicken was found dead and nearly devoured by rats; it seemed in excellent health the day previous. The third fowl appeared entirely well on the fifty-third day, when the experiment was terminated.

This observation established beyond the possibility of a doubt that glucose and talc are in no way to be considered as etiologic factors in the production of polyneuritis in fowls living on a general diet and running unrestrained about a large yard. This even holds true when glucose and talc are fed in amounts about sixteen times as great as would be eaten on an exclusive diet of "polished" rice.

Experiment No. 33.

Three pigeons that had lived 18 days on an exclusive diet of brown rice were continued on this diet for 53 days, during which time the rice was coated as heavily as could be with a mixture of about equal parts glucose and talc. There was probably at least 100 times as much glucose and talc on this brown

Digitized by Google

rice as is on "polished" rice. Fourteen days after the experiment was begun, one pigeon, fat and healthy looking the day previous, was killed by the other two. At the end of 34 days these two appeared perfectly normal and the experiment was discontinued.

This feeding test demonstrated that glucose and talc combined will not produce polyneuritis in pigeons living on brown rice when fed approximately 50 times as great a quantity as would be eaten on an exclusive diet of "polished" rice.

The last two experiments show that polyneuritis cannot be produced by glucose and talc in combination, when fed in amounts 100 times as great as would be eaten if the birds were eating "polished" rice exclusively and *ad libitum*. The determination as to whether glucose and talc would militate against recovery from polyneuritis when treated with a curative dose of the neuritis-preventing substance should prove interesting. The fowls used for the experiments bearing upon this point had developed the disease as a result of an exclusive diet of other food substances in addition to milled rice.

It is quite possible that some of the fowls that died would have recovered had they been fed the pericarp of the particular grain with which they had been fed instead of that of rice. In other words, it may be possible that though polyneuritis produced by a diet of wheat flour may be cured by wheat bran, it may not be equally benefited by rice bran. Not all cases of polyneuritis produced by milled rice recover even though large quantities of rice polish are administered. There has not been any dividing line between the cases that can recover and those that cannot recover. We believe the determining factor is the extent or completeness of the paralysis. We have noticed that in most of our cases which failed to recover following a proper dose of rice polish, the latter often ran back out of the mouth from the crop or remained in the crop sometimes a day or two until the fowl usually died. Usually the general paralysis is complete and no doubt little or none of the rice polish passed below the crop, and, therefore, none of it was digested and absorbed.

Digitized by Google

Experiment No. 50.

A pigeon with well-developed polyneuritis (convulsions and retractions) from exclusive diet of milled rice 15 days, was given through the tube 5 gm, rice polish, 2 gm. glucose and 1 gm. talc. In less than 48 hours the bird was apparently well and able to fly about the room.

Experiment No. 52.

A pigeon with typical polyneuritis produced by 24 days of exclusive diet of cream of wheat, was given 5 gm. of rice polish, 2 gm. glucose and 1 gm. talc. In about thirty hours the bird regained his normal condition and was able to fly about the room. The glucose and talc did not prevent recovery.

Experiments Nos. 53 and 54.

Two chickens with well-developed polyneuritis, paralyzed, one from exclusive diet of milled rice, the other from an exclusive diet of cooked milled rice, were each given 40 gm. of rice polish, 20 gm. glucose and 10 gm. talc. In less than 48 hours they were both able to run about. It is patent that the administration of glucose and talc did not in any way retard recovery.

Experiment No. 58.

A chicken with polyneuritis (convulsions and paralysis) from an exclusive diet of puffed rice was given 40 gm. rice polish, 20 gm. glucose and 10 gm. talc. The fowl (Fig. 60) was almost well in 48 hours. There remained some leg weakness lasting another day or two. The glucose and talc did not retard recovery.

Experiment No. 62.

A chicken just developing polyneuritis from an exclusive diet of corn grits was given 40 gm .of rice polish, 20 gm. glucose and 10 gm. talc. The fowl was almost well in 24 hours. The glucose and talc did not hinder the fowl from regaining its normal condition.

Experiment No. 63.

A chicken nearly paralyzed with polyneuritis from an exclusive diet of macaroni was given 20 gm. glucose and 10

Digitized by Google

gm. talc and put on a diet of whole wheat and brown rice. This fowl began to improve immediately and in about 36 hours was entirely well. The glucose and talc did not prevent recovery.

Experiment No. 64.

A chicken completely paralyzed from an exclusive diet of ordinary wheat flour was given 40 gm. of rice polish, 20 gm. glucose, 10 gm. talc. This fowl (Fig. 59) was almost well within 48 hours. The glucose and talc did not prove a bar to recovery.

Experiment No. 66.

A chicken with polyneuritis from an exclusive diet of cream of wheat was given 40 gm. of rice polish, 20 gm. glucose and 10 gm. talc. Recovery was complete in 3 days. The glucose and talc did not prevent recovery.

These last nine experiments show conclusively that glucose and talc do not prevent recovery of fowls from polyneuritis though as much is given at one time as they would eat on an exclusive diet of "polished" rice in more than 150 days.

In our several experiments we have produced *Polyneuritis gallinarum* by feeding an exclusive diet of twelve different common food substances, including milled rice. The results of these feedings will be presented in tabular form in another part of this article. None of these had any glucose or talc coated on them or mixed with them.

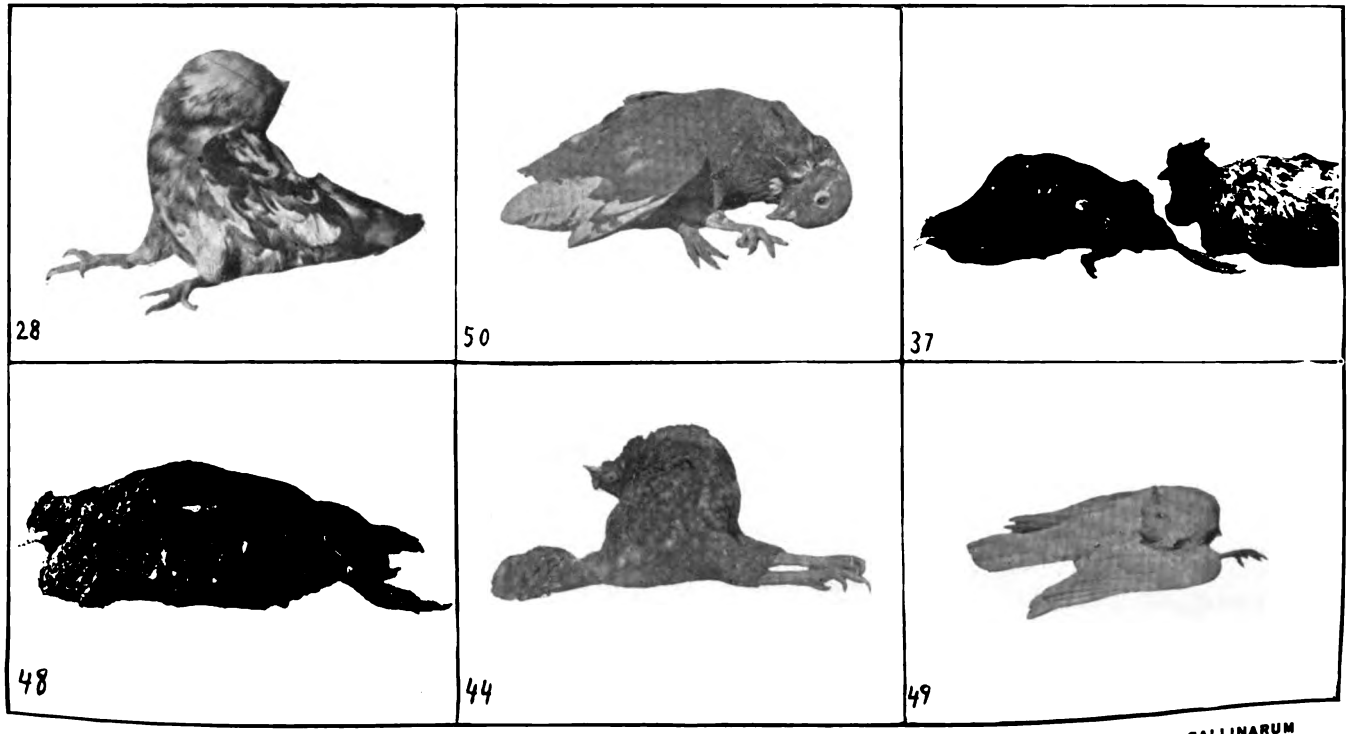
We believe that the evidence cited above demonstrates conclusively that the polyneuritis which follows the feeding of polished rice exclusively cannot be due to the very thin coating of glucose and talc with which it is finished.

In answer to the query: Will other common articles of diet produce polyneuritis in fowls when fed on an exclusive diet? there loom up some very interesting problems.

Numerous investigators have published reports of many instances in which the disease *Polyneuritis gallinarum* was produced by an exclusive diet of milled rice. In a former publication[1] we showed that the same condition could be produced by

1. N. O. Med. and Surg. Journ., lxv, 3, September, 1912, pp. 197-206.

Digitized by Google

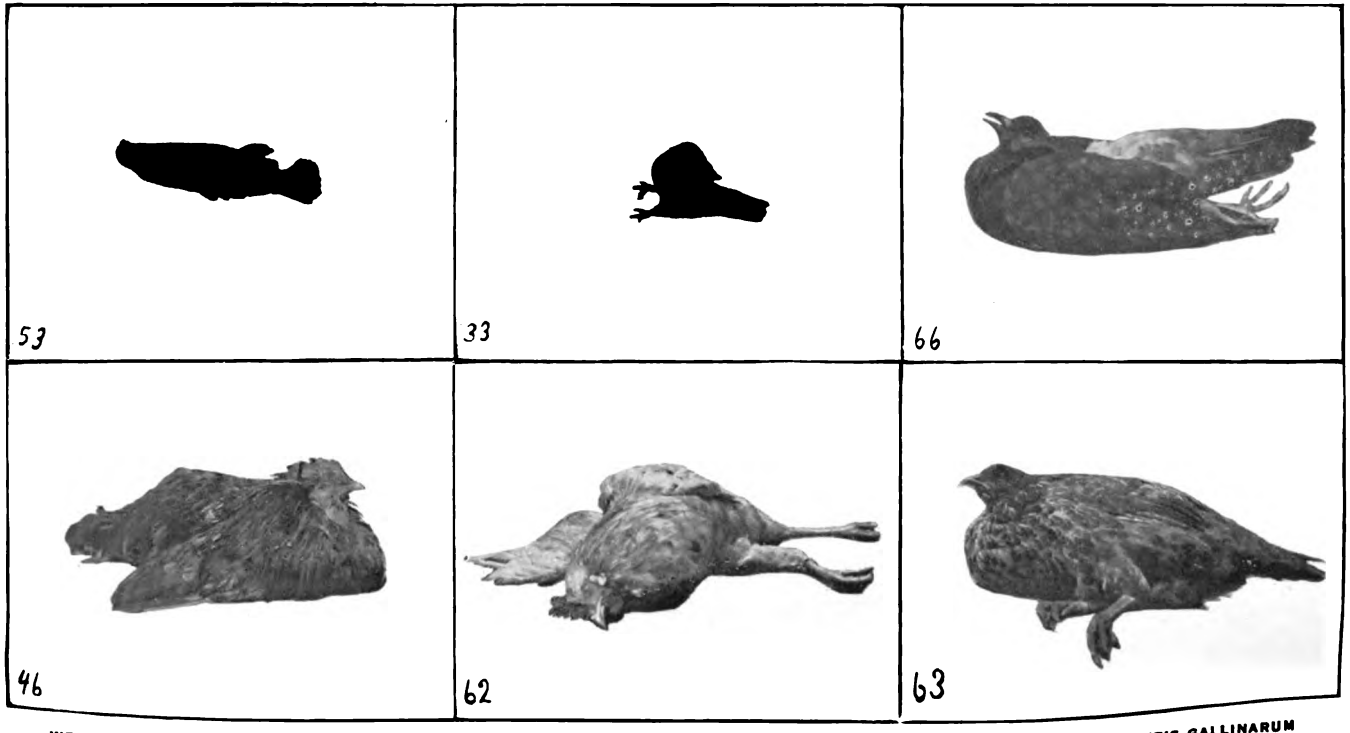


WELLMAN AND BASS

POLYNEURITIS GALLINARUM

Digitized by Google

Digitized by Google

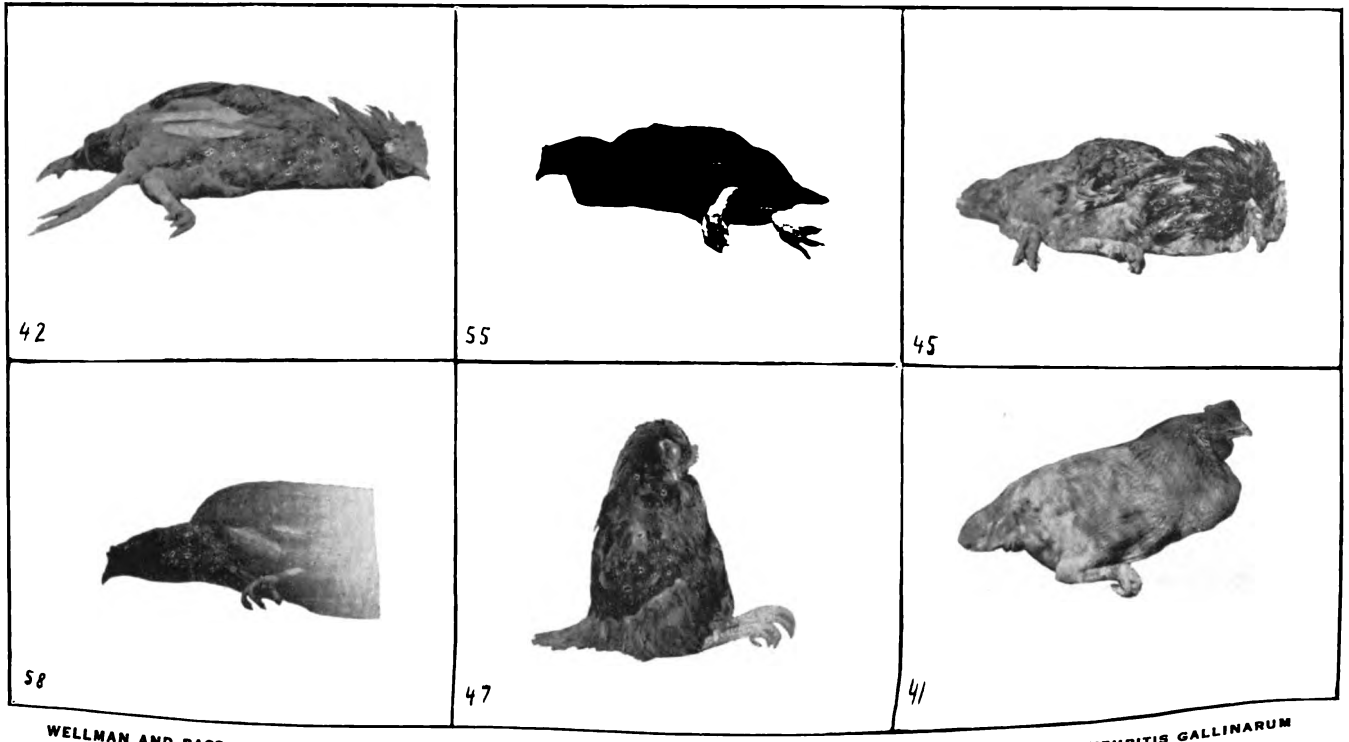


WELLMAN AND BASS

POLYNEURITIS GALLINARUM

Digitized by Google

Digitized by Google



WELLMAN AND BASS

POLYNEURITIS GALLINARUM

Digitized by Google

Digitized by Google

an exclusive diet of corn starch, Louisiana molasses, and a mixed diet plus oxalic acid, as well as by an exclusive diet of "polished" rice. Since that time we have produced the same condition by feeding exclusively a number of other common food substances in addition to those formerly employed. They are as follows: milled rice, corn grits, boiled sweet potatoes (one case doubtful), boiled Irish potatoes, sago, macaroni, puffed rice, cream of wheat, and ordinary wheat flour.

The following table shows the number of birds or fowls fed on each article in these latter experiments, together with the length of time necessary to produce the disease.

Number of Experiment	Bird	Food	Number of days fed before the appearance of the disease	Fig. No.	Remarks
34	Pigeon	Milled Rice	18 days	28	
34	"	" "	35 "	50	
34	"	" "			53 days; still well.
41	Chicken	" "	20 days	37	Rooster.
41	"	" "	29 "	48	
41	"	" "	45 "		
42	"	" " boiled			Killed by mates 2nd day
42	"	" "	22 days	37	Hen.
42	"	" "	32 "	44	
35	Pigeon	Corn Grits			Died; no neuritis.
35	"	"	35 days	49	
35	"	"	38 "	53	
36	"	Cream of Wheat	24 "	33	
36	"	" "	31 "	66	
36	"	" "			53 days; still well.
39	Chicken	Boiled Sweet Potato	28 days		
39	"	" " "			48 days; still well.
40	"	" Irish "	16 days		
40	"	" " "	33 "	46	
44	"	Cream of Wheat	42 "	62	
44	"	" "	43 "	63	
45	"	Sago			
45	"	"	24 days	42	Typical.
46	"	Macaroni	37 "	55	Typical.
46	"	"	44 "		
47	"	Wheat Flour	31 "	45	
47	"	" "	57 "	58	
48	"	Puffed Rice	33 "	47	
48	"	" "	46 "		
49	"	Corn Starch	31 "		
49	"	" "	33 "	41	

Digitized by Google

From the above table it may be seen that in the experiments here referred to the average number of days required to produce *Polyneuritis gallinarum* with the different articles of diet was as follows: sago 20½, boiled white potatoes 24½, boiled milled rice 27, corn starch 32, milled rice 33, wheat flour 34, corn grits 36½, boiled sweet potatoes 38, cream of wheat 39, puffed rice 39½, macaroni 40½. Two common articles of human diet, viz., sago and boiled Irish potatoes, actually produced the disease in a shorter time than did any form of rice, and a third one, corn starch, produced it in a shorter time than did raw milled rice. Since sufficient cooking is known to destroy the neuritis-preventing substance, the cooked foods in these experiments can hardly be fairly compared with the uncooked foods.

The conclusions that seem to be justified by these experiments are:

1. Glucose and talc, when fed together or separately, do not produce *Polyneuritis gallinarum* in birds receiving a diet which does not itself produce the disease.

2. Glucose and talc in large amounts do not prevent prompt recovery from *Polyneuritis gallinarum.*

3. *Polyneuritis gallinarum* can be produced by feeding milled rice and many other food substances which have neither glucose nor talc on them.

4. Glucose and talc, therefore play no part in the production of *Polyneuritis gallinarum* which results from an exclusive diet of "polished" rice.

5. These experiments indicate that legislation or regulations against the sale of "polished" rice, based upon the fact that *Polyneuritis gallinarum* results from feeding it as an exclusive diet, are not warranted.

6. The evidence here presented indicates that several other common articles of diet produce *Polyneuritis gallinarum* as certainly as does rice, either "polished" or unpolished; in three instances these other foods produced the disease in quicker time than did rice.

7. There is, therefore, more argument against the sale of these common articles of diet, sago, Irish potatoes and corn

Digitized by Google

starch, than there is against the sale of rice, "polished" or "unpolished," milled or undermilled.

Discussion.

Capt. Charles F. Craig, Washington: In countries where rice is the staple article of diet, laws should be passed prohibiting the sale of milled rice. In the United States, on the other hand, such legislation is absurd. If laws are passed in this country against milled rice, it will subject us to much ridicule.

Dr. H. R. Carter, Baltimore: The production of beri-beri depends upon the absence of some essential element of diet. Legislation against milled rice in the United States is ridiculous.

Dr. Isaac W. Brewer, Taughannock Falls, New York: In the Orient it is necessary to provide a more liberal diet in order to present beriberi, but, in the United States, the enaction of laws prohibiting the sale of milled rice is preposterous.

Dr. William S. Krauss, Memphis: In Memphis, during one of the Mississippi river floods, two boys were marooned on a levee for several days and had nothing to eat but beans. Both of these boys had paralysis of both legs, and all as a result of this diet.

Major Weston P. Chamberlain: I am convinced that beri-beri and polyneuritis gallinarum are identical so far as a disease affecting two animals as different as fowls and man can be. The main difference in the two diseases lies in the fact that there is no edema produced in the disease in the fowls. The symptoms in both man and fowl are very similar. In the latter acute cardiac attacks and pulmonary edema are observed, but the etiology of the two diseases appears to be the same. There is a deficiency of some important nutritive element in a diet composed entirely of highly milled rice; the disease is not due to a poison. It is a well-known fact that polyneuritis may also be produced by starvation. Legislation against highly milled rice is desirable in the Orient, but it is stupid to pass any laws against highly milled rice in the United States. The population of Oriental countries should be supplied with a more varied dietary. In legislating against highly milled rice in this country, we are putting ourselves in a wrong light, and such legislation will weaken our position when it becomes necessary to advocate some important sanitary laws.

Dr. Creighton Wellman, New Orleans: The rice condition in the Orient and in the United States are absolutely different. Highly milled rice is difficult to preserve. It is more liable to fermentation and is more likely to be infested with weevils. Rice coated with glucose and talc keeps well. This coating is unimportant in the production of beriberi. By supporting such legislation as this we will make ourselves appear foolish, and when more important subjects come up for legislation we will find our position weakened.

The following resolution was unanimously adopted:

"Resolved, This Society deprecates legislation in this country against milled or polished rice as a food."

Digitized by Google

PERIPHERAL NEURITIS IN THE AMAZON VALLEY.*

By CARL LOVELACE, M. D.,
Porto Vallo, Brazil, S. A.

A few months ago I published a paper on the Etiology of Beri-beri.[1] In this paper I reported 963 cases of peripheral neuritis treated in a railway hospital in North Brazil. My conclusions were: (1) that a peripheral neuritis attended by high mortality prevailed in North Brazil, (2) that this neuritis was a clinical entity which must be classified as beri-beri or as a member of an as yet hypothetical beri-beri group, (3) that this disease bore no intimate relation to the consumption of rice as a staple article of diet, (4) that it was not due to the absence of any food principle in the diet of those whom it attacked.

That this disease was not intimately associated with a rice diet and that it was not due to the absence of any of the recognized food elements, were conclusions unavoidable in the face of facts pertaining to the incidence of the affection. That is to say, it attacked persons who had previously eaten no rice whatever, a larger number of persons who had eaten it only occasionally, and a great number of persons in whose diet rice could not be considered the staple factor. It was not confined to the laborers, but prevailed among the employees of the higher grade, whose diet was varied and abundant. In addition, there was both a place and a seasonable variation in its occurrence.

While I cannot here give an extended description of this disease, I shall attempt to show, very briefly indeed, that it was clinically and anatomically indistinguishable from the beriberi of the Orient, and refer those interested to the previous communication for a more complete account. For convenience, one could say that there were two types of the disease: First, the cardio-vascular type—in which circulatory symptoms predominated, and, second, the paralytic type—in which paralysis

*Received for publication June 28, 1913. This paper is also to appear in a forthcoming number of The Texas State Medical Journal.

1. Lovelace, Carl. The Etiology of Beri-beri, Journal of the A. M. A., December 14, 1912.

Digitized by Google

of various muscle groups, with areas of perverted sensation, was the characteristic feature. Very naturally the majority of cases presented both sets of symptoms: there was tachycardia, perhaps arhythmia and reduplication of the second sound over the pulmonic area; perhaps some dyspnoea; edema particularly over the shins; the deep reflexes were usually exaggerated but frequently lost; areas of anesthesia, hyperesthesia or paresthesia were frequently present; motor paralyses showing a predilection for the extensors of the leg and forearm, although any muscle group was liable to be affected, were present. There was a group of fulminant cases—*beri-beri galopante*, in the vernacular—in which the whole course of the disease from the very first symptom to the final flutter of the dilated heart, might occupy less than one week; and there was the group of paralyzed wretches, bedridden for months or years, whose best hope lay in the merciful intervention of some kindly intercurrent malady like lobar pneumonia or bacillary dysentery. There was also a very remarkable group characterized by the rapid onset of a more or less complete paraplegia.

The mortality was from 15% to 20% and anatomically there was atrophy of the skeletal muscles, dilatation and hypertrophy of the heart and effusions into the serous cavities, particularly the pericardium. Frequently the whole cadaver was water logged.

While I was certain of the validity of my own conclusions and of the truth of their premises and while I could not doubt the evidence before my eyes in the shape of well-fed, non-rice eating, young adults become victims of a peripheral neuritis corresponding in all respects with the clinical descriptions of beri-beri, I was nevertheless much impressed by the apparently conclusive experiments of Fraser and Stanton, Strong and Crowell, Chamberlain and Vedder, Heiser and others, in the Orient. I shall recite briefly the most notable of these experiments:

Fraser and Stanton's Experiments.

Three hundred Malayan prisoners were set at work, road building on the Malayan peninsula. They were well taken care of in every way and the sanitary surroundings well regulated.

Digitized by Google

They were divided into two groups as to their diet, but in every other way lived the same lives. Group one was fed polished rice as an integral part of its diet. Group two was fed parboiled or unpolished rice, to which a large part of the pericarp was clinging. The polished rice group developed beri-beri—a large number of cases—within three months. The unpolished rice group developed no beri-beri.

The conditions were then reversed. Group one was fed unpolished rice, and group two polished rice. The new polished rice group, after a longer period, developed beri-beri. The unpolished rice group not only developed no new cases of beri-beri, but those who had been attacked by the disease under the polished rice diet were cured by the diet of unpolished rice.

The influence of place and communicability were then tested with negative results. Starting from this experiment polished rice was fed to fowls and a neuritis produced almost at will. When parboiled rice and rice polishings were added to the diet, the fowls seemed to be protected.

Attempts to extract a poison from polished rice failed, but when the pericarp was removed from the unpolished rice it no longer had protective power. From unpolished rice they partially succeeded in extracting the protective principle. Extraction in alcohol and then dissolving in .3% hydrochloric acid yielded phytin, a complex organic compound, with a high percentage of phosphorus pentoxid. As the amount of phosphorus pentoxid had served as an index to the ability of a substance to prevent beri-beri, it was thought that this might be the desired constituent. Such was not the case, as the extract, after the removal of the phytin, was still effective.

Eijkman's Experiment.

Eijkman experimented on 280 prisoners, dividing them into three groups. Those who ate polished rice developed beri-beri at the rate of 1 in 39. Those who ate a mixture of polished and unpolished rice developed beri-beri at the rate of 1 in 416. Those who ate unpolished rice developed beri-beri at the rate of 1 in 10,000.

Digitized by Google

Strong's Experiment.

Strong experimented on 29 prisoners under sentence of death in Bilibid Prison, Manila. Without giving his experiment in detail, I will quote his conclusion:

"It is evident that among the individuals comprising our experiments, beri-beri was produced only by means of the diet, and therefore has a true dietetic causation. It is further evident that beri-beri develops owing to the absence from the diet of some substance or substances necessary for the normal physiological processes of the body. Without the supply of such substances in the food, beri-beri develops. Such a substance is evidently present in red rice or rice polishings."

Considering that Koch, Durham, Herzog and a host of other workers of the first rank have sought, in vain, for a biological cause of beri-beri, one can but confess that these experiments bear an aspect which savors of finality. They are conclusive to the effect that a fatal neuritis can be produced in man and in animals by a monotonous and defective diet.

Thus, through the years has the student of beri-beri been confronted by two opposing clouds of witnesses: one side claiming that the disease is due to the deprivation of the animal economy of something that it needs; the other, that it is due to the absorption from without of something harmful to the organism. In making up a verdict, which is the most scientific procedure, to deliberately impeach the testimony of scores of students of the disease, to reject utterly the judgment of many trained observers, such as Manson, Herzog, and others, or to see if there be not truth in the claims of both sets of witnesses?

We have known for a long time that a multiple neuritis may be induced by widely diverse agents: by lead, by alcohol, by arsenic, by the bacillus typhosis, by the Klebs-Loeffler bacillus and by the spirochaete of syphilis. Fraser and Stanton have shown that a more or less exclusive diet of polished rice will cause it. But does this, therefore, exclude additional etiological factors? Many of us have been called upon to treat the various neuritides mentioned above except, perhaps, the last. Some of us have doubtless had cases of multiple neuritis that we could

Digitized by Google

not classify. We could exclude all the known causes of multiple neuritis. We were forced to call these cases essential or idiopathic multiple neuritis, meaning thereby a multiple neuritis, the cause of which we did not know. Now, in various parts of the world, notably Japan, China, the Malay Peninsula, the Philippine Islands and the Amazon Valley, instead of seeing perhaps two or three such cases in a lifetime, the practitioner may see them any hour of any day, and out of the depths of his ignorance he calls them beri-beri.

The work of Fraser and Stanton in the Malay Peninsula, and its confirmation by other observers in the Philippines, marks a great advance in our knowledge of the etiology of peripheral neuritis; we now know that to lead, arsenic, alcohol, diphtheria, typhoid fever, syphilis and other infectious diseases we must add another causal agent—a certain form of starvation. Thus has a considerable area of what was the unknown, become the known; a segment of darkness has been brought into the light. But has the whole field become clear? Is the question of the etiology of beri-beri to be regarded as settled? I think not, unless one chooses to restrict the term beri-beri to that particular form of polyneuritis caused by a form of starvation. If one chooses to do this he shall still have before him, for further investigation, a certain "acute, subacute or chronic disease, characterized clinically by disturbances of the circulation, of motion and sensation, and associated anatomically with hypertrophy and degeneration of the heart, peripheral nerves and voluntary muscles, but not related etiologically to a diet of polished rice or other apparent form of starvation."

Some years ago Sir Patrick Manson suggested that just as we include under the term "dysentery" a number of diseases that are clinically almost indistinguishable, so under the term "beri-beri" we may be attempting to place two or more diseases that are clinically identical but etiologically widely separated. This is the suggestion that I want you to consider before you make up your minds that the last word on this subject has been spoken. Verily, it has not. Let us accept as proved that a diet of polished rice will cause polyneuritis; but let us not attempt to stretch this etiological factor to cover all

Digitized by Google

cases of endemic polyneuritis of whose causation we have heretofore deemed ourselves ignorant, any more than we would attempt to make it cover sporadic cases of polyneuritis of unknown etiology.

Summary and Conclusions.

1. Among the 963 cases of beri-beri to which reference is made, were many in which the factors of defective diet and of a rice diet could be positively and definitely excluded. This is in line with the reports of many observers in many parts of the world.

2. The experiments of Fraser and Stanton, confirmed by other workers, are conclusive to the effect that the beri-beri symptom-complex may be induced by a diet of polished rice.

3. As a corollary from these two conclusions, and considering the multiplicity and diverse characters of the agents that are known to cause multiple neuritis, it is highly probable that the term "beri-beri" is one that has been used to cover not a single disease, but a group of diseases, more or less indistinguishable clinically.

4. The question of the etiology of beri-beri cannot yet be regarded as settled.

Digitized by Google

NOTES ON SPRUE IN PORTO RICO AND THE RESULTS OF TREATMENT BY YELLOWED SANTONIN.*

BAILEY K. ASHFORD, M. D., Sci. D.,
Major Medical Corps, U. S. Army, San Juan, Porto Rico.

Sprue is by no means a new disease in Porto Rico, but the attention it is receiving under this name among medical men here is a matter of only a few years. Heretofore its milder forms were considered to be a peculiar gastro-intestinal derangement of tropical countries especially prone to attack "unacclimated strangers" who stayed too long in these latitudes; its severer manifestations received a variety of names, prominent among which were "pthisis intestinal" (a lay term), "escorbuto tropical" (tropical scurvy), and simply "anemia."

That, however, the sprue of Porto Rico is not so severe, as a rule, as that depicted by the Dutch in Java, and the English in India, seems probable. Carnegie Brown, in his work "Sprue and Its Treatment" (Wm. Wood & Co., N. Y., 1908), says:

"It is also peculiar that, though a disease apparently identical with sprue was described by Hillary, of Barbados, 150 years ago, as not being uncommon there, and in Jamaica, nothing now seems to be known of it in these islands. I am aware that cases have from time to time been reported from various places in the Western Tropics, but it is questionable, in my opinion, whether genuine sprue ever originates in any part of the world except the tropical and subtropical regions of Eastern Asia."

As a matter of fact, Dr. Hillary, reporting cases from the West Indies, seems to have been the first to describe sprue, and to suppose that the disease disappeared completely, to reappear and isolate itself in the East a hundred years later, requires a stretch of imagination.

However positive such statements may be, a large number of physicians in Porto Rico are daily treating what seems to be

*Read with permission of the Surgeon General, United States Army, at the Tenth Annual Meeting of the American Society of Tropical Medicine, held at Washington, May 6, 7 and 8, 1913.

Digitized by Google

genuine sprue, as far as clinical medicine will permit of a positive diagnosis, for in the absence of a recognized microbic cause no microscopic corroboration can be cited to prove such a diagnosis either in the East or West Indies. The fact that it has never heretofore been designated "Sprue" does not negative its previous existence here, nor that the symptom-complex by which alone it is recognized did not elevate it to the position of a disease *sui generis* among local physicians, although under other names. There is a saying that when a Spaniard gets intestinal trouble in Porto Rico he must make haste to reach home or he may never get away. A disease generally more prevalent in towns, sprue attacks especially those of northern climate of long residence here, and it has for years been known to be exceedingly rebellious to drugs. That it by no means limits its ravages to strangers to the Tropics will be seen later.

At least four cardinal symptoms and signs are needed before we make a positive diagnosis:

1. The typical sprue tongue.
2. The small liver.
3. The characteristic stool.
4. The long-continued and excessive production of gas in the intestine (intestinal fermentation).

The tongue is glazed, shiny, and lacking in fur or papillae, at least at its edges, during a lull in the mouth symptoms; red at the tip and edges, punctuated by little vesicles surrounded by a red areola, or completely raw, during an exacerbation of the stomatitis. The lips, buccal cavity, and in fact, the pharynx and on down an indefinite distance, may be in the same condition.

The liver is much reduced in size, its lower border retiring to surprising distances from the costal margin in the mid-axillary line.

The stools are pasty, or frothy ("decomposed," as the Spanish term has it), evil-smelling, unnaturally large, and light in color with a tendency toward the gray, white or light yellow. A mucous stool is not a characteristic sprue stool. There seems to be a general tendency also to early morning evacuations, but severe cramps and colic are not common. One of the most constant and distressing symptoms is accumulation of abdominal

Digitized by Google

gas. "Everything I eat bloats me," is the universal complaint. The result is that patients state that they "can't eat," not from lack of appetite, but for fear of the discomfort caused thereby. Since I first began to recognize the disease, to date I have accumulated notes on 86 cases of what I believe to be sprue. I have 30 more which lack some of the cardinal points cited as necessary for a positive diagnosis, but which seem to be inexplicable otherwise and can be considered as probable cases. These latter, however, are not herein included. I wish to mention the fact that Drs. Pedro Gutierrez and Isaac Gonzalez Martinez have at times actively coöperated in the study of some of these cases, while in others consultation with other colleagues, members with myself of a committee for the investigation of sprue and designated by the Porto Rican Medical Association, have been freely resorted to. While the opinions expressed in this paper are based upon my personal series and they cannot be held responsible for them, grateful acknowledgment is hereby made for their coöperation.

Of the 86 cases there were:

19 Americans
56 Porto Ricans
8 Spaniards
2 Natives of other Antillan Islands
1 German

As to age:

Under 20	9*
20 to 40	53
40 to 60	18
60 to 80	6

*Two of these were 4 years old.

Of 83 cases, 11 were poor and 72 enjoyed the comforts of life to a greater or less extent. Most of the patients were in the class of well-to-do persons, whose homes and habits were of the best.

These 83 cases, classified as to intensity of the disease, result as follows:

Light cases	4
Moderate cases	30

Digitized by Google

Marked cases	39
Severe cases	10

Sixty-eight were distinctly anemic, many profoundly so, the marasmic toxemia of Carnegie Brown.

Seventy-six were under my treatment, of whom 12 were sent North.

Subjected to the milk "cure"	62
Subjected to the meat "cure"	3
Subjected to the fruit "cure"	1
On a general diet	2
On various diets with santonin	8

The results of treatment are as follows:

Apparently cured	24
Improved	11
Unimproved	19
Result unknown	23
Died	9

Before proceeding to the analysis of the following eight cases, certain features of the disease may be emphasized.

In the sprue seen in Porto Rico the mouth symptoms show a remarkable tendency to alternate with those of the bowel. When diarrhea occurs the stomatitis is apt to improve or disappear and *vice versa*.

A quite constant condition in this disease is hypochlorhydria. Carbohydrate digestion is very defective and a great reduction in absorption of fats occurs.

The natural tendency of sprue is toward what Carnegie Brown felicitously terms a "marasmic toxemia," with intense anemia. Once this toxemia becomes marked the prognosis is serious, but in its early stages, and often even when well marked, sprue is not seemingly difficult to control, with appropriate diet, the only real basis for all successful treatment.

Case 1.—November 2, 1912.. Mrs. V. G. H.; Caguas; age 34; American; no children; long residence in Porto Rico; no previous disease.

The patient has consulted me for what she describes as a severe gastric and intestinal "indigestion." The affection began almost imperceptibly about a year ago, and has reached

Digitized by Google

a point where she is "unable to eat anything without intolerable fullness and heaviness in the stomach and bowels, followed by diarrhea." She has a good appetite but is "afraid to eat." Is sallow, not emaciated, but evidently profoundly disturbed over her condition, which she is not able to clearly explain. Careful questioning and examination brought out the following:

There is an irregular stomatitis characterized by the appearance of numerous aphthae on mucous membranes of cheeks and edges of tongue. At times these are found on the palate and under tongue. At intervals the whole tongue becomes violently inflamed without swelling, and peels, leaving a raw and sensitive surface which interferes with the ingestion of food, especially of condiments, acids, etc. At present the tongue is glistening and apparently devoid of papillae, but it is not actively inflamed. There is no nausea nor vomiting, but she complains of a rawness and burning in mouth, esophagus, and, at times, of the stomach. Her chief suffering, however, is gas in the abdomen, greatly augmented by ingestion of food. Instead of the well-being normally experienced after a hearty meal, she feels a distressing fullness and faintness. She reports that her stools are apt to occur in the early morning, so early as to cause her to arise at 5:30 or 6. They are "loose," but not watery, light in color, frothy, of vile odor, very abundant, and full of bits of undigested food. After a series of from two to four morning stools, all of which relieve her but leave her very weak, she has no more during the day.

Physical examination disclosed only a small liver. The feces are full of fat and devoid of ova of parasites. Blood: hemoglobinometric reading lost; differential count of leucocytes showed:

Polymorphonuclears	55%
Large lymphocytes	15%
Small lymphocytes	30%
Eosinophiles	0

Treatment.—She was put to bed and a strict milk diet ordered:

60 ounces the first three days
70 ounces the second three days

Digitized by Google

80 ounces the third three days
90 ounces the fourth three days
100 ounces the fifth three days

Thereafter not less than 100 ounces *per diem* and not over 120. The milk was previously warmed and taken through a straw, every hour and a half.

Twice a week a full dose of castor oil was administered at bedtime, and on three successive days in each week, one gram of yellowed santonin (Burroughs & Wellcome, London), divided into three doses daily. The santonin was mixed into a tablespoonful of olive oil.

Nov. 9. There is active stomatitis. The tongue has become violently inflamed with exfoliation and there is deep injection of the soft and hard palate with general distribution of vesicles on tip and borders of tongue and over buccal cavity and palate. The diarrhea has disappeared, but after taking the santonin she complains of a "sickish feeling" and pain in the loins. She has become very weak and tincture of nux vomica was added to the regimen above described.

Nov. 16. Still complains of gastric "dyspepsia."

Dec. 4. Is practically well. Has gained in weight, color and spirits and her symptoms have disappeared save a little fermentation from time to time in the bowel.

This patient, who used to be a hospital nurse, gradually took up her regular diet of health, always carefully supervising the carbohydrate element, and has remained well to date. The santonin produced in this case a definite and severe pain in the loins, with diminution of urine, although no clear evidence of nephritis could be established. It should be further noted that the pains, while severest in the loins, were not limited thereto, but extended to the entire body.

Case 2.—October 31, 1912. Mr. J. E. W.; Trujillo; age 45; short residence in Porto Rico (about two years). Has been sick for six months. His principal symptoms are stomatitis, foamy, grayish diarrhea, and extreme debility with anemia. He is a Tennessee mountaineer, of powerful physique, and has never been ill up to this time save that he acquired uncinariasis shortly after reaching this island, of which he was promptly cured.

Digitized by Google

He complains bitterly that he is not the "man he used to be," that any work tires him out, that he is always in a bad humor and that he finds himself "lolling around when he ought to be doing something."

The symptoms are typical of sprue. He has a small liver and a hemoglobin of 45%. His differential count of leucocytes is as follows:

Polymorphonuclear leucocytes	38%
Large lymphocytes	10%
Small lymphocytes	52%
Eosinophiles	0

Treatment.—Strict meat and water diet. Two pounds of lean fillet chopped up with 2 ounces of suet, divided into six portions, one portion being administered every three hours. The meat was prepared by rapidly turning it over in a hot frying pan with a little butter until browned, but not cooked through.

One gram of yellowed santonin administered on three days of each week as in preceding case.

Nov. 11. He complains of much diarrhea. Santonin given in 0.325 doses twice daily on each day in the week. One teaspoonful of tannin-agar three times a day. Strict milk diet substituted, as per case 1, for meat.

Nov. 25. Is much improved. Stopped santonin.

Dec. 2. Feels quite well. Bowels and mouth normal. Hemoglobin 85%.

What attracts attention in this case is the rapidity and permanence of the cure, for he remains well. The rise in hemoglobin occurred on a strict milk diet and without the administration of iron.

Case 3.—Dec. 18, 1912. Mr. S. D.; San Juan; age 65; Porto Rican; lived here all his life. Has been sick some four years but has lately become bedridden. Typical case of sprue in stage of marasmic toxemia. An interesting feature of this case was the patient's unconquerable greed for leguminous and farinaceous foods. Vomited milk every time he essayed to take it, and utterly refused to continue meat diet after the first day. A Cammidge reaction was practiced in this case and was found to be negative.

Digitized by Google

In despair of instituting either a milk or meat diet, I instructed him to eat only fresh fruits. His menu was bizarre and consisted of melons, mangoes, alligator pears, oranges, prunes, strawberries (of this island, a kind of raspberry), etc. After a short while he fell from grace and indulged in all sorts of carbohydrates. Up to his return to carbohydrates I had systematically administered santonin, 5 grains twice a day, for a period of about three weeks, but seeing that he was unwilling to submit to any restriction, I was compelled to abandon his case. He is now out of bed and, though still weak and sick, has greatly improved.

It is interesting to note in this case that in spite of insufficient and improper food, after the administration of santonin, he improved, and that his stools contained great numbers of *Balantidium coli,* the greatest number I have ever seen.

Case 4.—January 15, 1913. Mr. J. D.; San Juan; age 60; Spaniard; lived here all his life, save first few years of boyhood. Sick for about one year. Small liver, typical tongue and stools and marasmic toxemia. He is now in the Hospital of the Institute of Tropical Medicine and Hygiene of Porto Rico, and Dr. Gutierrez, who now has charge of him, reports that he is improving rapidly; he is taking large doses of yellowed santonin.

Case 5.—January 2, 1913. Mr. M. I. L.; Naguabo; age 40; Porto Rican; lived here all his life. Sick only three months, during which time he lost 30 pounds. Sent me for treatment by a colleague with a diagnosis of sprue. Illness began with fever, dryness of throat and mouth, diarrhea and pain over liver. Tongue became red and raw. He complains of "acidity of the stomach, burning in stomach, esophagus, and mouth, and great weakness."

This man is improving under 1 gram of yellowed santonin for three successive days of each week. His case is interesting for the rapidity with which he reached the stage of toxemia. His signs and symptoms are those of a clear case of sprue.

Case 6.—Mrs. M.; Utuado; age 30; Porto Rican; wife of a wealthy planter. Has been ill for ten years. History shows that it was undoubtedly a case of sprue from the beginning. In January of 1912 her case was diagnosed "sprue" by Dr. Roses

Digitized by Google

Artau of Arecibo and he advised her to go to Europe. Dr. Roses himself, in Spain shortly afterward, reported the case to the Instituto medico-farmaceutico of Barcelona, as up to this time the disease had not been recognized there save by those who dedicated their time to the study of tropical diseases. Her hemoglobin when Dr. Roses saw her was 45%.

When I first saw her, about two months ago, she was in a state of extreme prostration, emaciated, very pale and hardly able to walk without assistance. Her tongue, stools, liver, and general condition were typical of the terminal stage of sprue.

She was placed in hospital on the same regimen as that recounted for case 1 and after a week began to improve.

This case is the most typical I have ever seen and corresponds in all points with the type described by the English in India. The tongue, after a quiescent period of a week or ten days, in which all that can be noted is a glistening, highly polished dorsum, smooth and apparently bereft of papillae, will in twelve hours become fiery red, raw and exceedingly painful. Aphthae appear in the buccal cavity and on the tip and edges of the tongue; this organ is small and slightly fissured. All of this will disappear in a few days and the stools will increase in frequency, with the whitish-gray color, foul odor, great abundance and foamy character depicted in other cases.

At first the emaciation was extreme and vomiting frequent. The intestinal fermentation was so great as to distend the abdomen and cause palpitation of the heart and difficulty in breathing.

Her hemoglobin was 20% but her urine was practically normal save for an increase in indican.

While on a strict diet of 80 ounces of milk *per diem*, the 24-hour feces were saved and examined with the following result:

Total weight of feces in 24 hours	1,138.4 g.
Total fat (neutral fat, fatty acids and soaps)	53.28 g.
Total nitrogen	13.97 g.

The milk she was consuming contained 3% fats.

After the second week of santonine I was obliged to give 5 grains a day, instead of 1 gram daily for three successive days,

Digitized by Google

and the drug produced great dizziness and pain in the back, body and limbs, with scanty, high-colored urine. There was, however, no indication of nephritis. After ten days more I saw the necessity of withdrawing santonin altogether, owing to her bitter complaint of its effects. She has now completed her eighth week on a milk diet but for the last three weeks has been also taking strawberries and small bananas. Is remarkably improved and has gained in weight. Her hemoglobin is 65%, her mouth is rarely sore, her abdominal distension has disappeared and her stools are of normal color and frequency. She is still under treatment.

Case 7.—Miss J. D.; Ciales; age 28; Porto Rican of prominent family; has lived in island all her life. I cured her of a quartan malarial fever by intramuscular injections of quinine. Her case is one of sprue complicated by quartan malarial fever. She has great intestinal fermentation, and the typical tongue, liver, and stools. Her hemoglobin is 35% and her general state that of a rapidly deepening toxemia. After her complete cure of malaria I began the treatment outlined in Case 1, but could not sustain the gram doses of santonin after the first week. I therefore administered 0.325 of the drug in olive oil each morning. This was sustained for three weeks without any evil effects.

After six weeks, in which nearly four weeks were dedicated to systematic administration of santonin and the entire period to a strict milk diet, the last four weeks of which she had 100 ounces daily, this young lady has made a rather unusual recovery. She is in good color and spirits and has no symptoms whatsoever of her former affection. She is, however, on a meat and fresh vegetable diet and will remain so for at least another month, when the return to carbohydrates will be cautiously made.

Case 8.—Mrs. J. S. L.; Bayamon; Porto Rican of well-known family; lived all her life in this island up to time she fell ill. Five years ago she was in excellent health, but states that she went to live in a poorly sanitated house and in two days was taken ill with vomiting, colic and diarrhea, followed by intestinal fermentation. There was no fever. After passing a short time in miserable health, due to diarrhea, gaseous distension of the

Digitized by Google

bowels, gastric dyspepsia, and sore mouth, she went to Europe, where they diagnosed her case "nervous dyspepsia." She returned in six months worse than when she left. Once more in Porto Rico, she was given potassium iodide, under the impression that she was rheumatic, as she was then complaining of vague body pains and had had what seems to have been a mild pseudo-angina pectoris. The iodide apparently greatly increased her gastric and intestinal symptoms.

She is pale, emaciated, extremely weak and markedly neurasthenic. There are some aphthae in the mouth, but the tongue is heavily coated with a yellowish fur and is not typical of sprue. There is much nausea but rarely vomiting. There are acid regurgitations, great accumulation of gases in the abdomen, and, from time to time, loose morning movements, of vile odor, foamy, and light in color. The liver is slightly reduced in size. The hemoglobin is 55%.

She was placed on milk, santonin and castor oil, as per Case 1, but after the first week, only 0.325 of santonin daily was administered for reasons already stated in other cases. In three weeks she had greatly improved and fruit was added to her milk diet. Her pains have disappeared, she has no diarrhea, the color of the stools has become normal, there is no longer heartburn, and her strength is rapidly returning. One month from her first visit, during which time she had been continuously under santonin, 0.325 daily, with the exception of the first three days (when 1 gram daily was administered), she was so much improved that a meat, fresh vegetable and fruit diet was instituted. The santonin in 5-grain doses daily caused no untoward symptoms. She is still under treatment.

With one exception these eight cases were treated in their homes, clinical laboratory data could not be taken at regular intervals, and any insufficiency in these histories may thus be explained.

Sprue, while not limiting itself to the well-to-do, is, in this island at least, far more prevalent among those who have all the comforts of home, and such persons strongly resist going to a hospital. In fact, these homes furnish the large part of the material here upon which sprue, a little understood disease,

Digitized by Google

must be investigated. To draw definite conclusions as to the effect of santonin from these eight cases would be imprudent. Were the results of treatment by diet alone withheld one might be tempted to reservedly accept santonin as a fairly efficient weapon against sprue, but the fact remains that the disease cannot be successfully treated until starches, sugars and fats are well nigh eliminated from the diet. Santonin alone seems powerless to cure.

Moreover, I have selected the following eight cases which correspond closely in clearness of detail and severity with the eight already cited, and these cases only received a milk diet without drugs. They all made a good recovery and the return to health of one or two has been widely commented upon in the locality in which they live.

Case 9.—An old lady of over 70 years of age, mother of a physician, with 20% hemoglobin, with anasarca and in the last stages of the disease. Duration of treatment 4 months.

Case 10.—A young man of 24 years, son of a minister and student in one of our American universities. Taken ill in May, 1908, and considered to be tuberculous in the United States, without, however, having demonstrated bacilli in the sputum. First seen by me on July 19, 1909. Was then an extreme case of sprue, with great pallor and edema of lower extremities. He had to be helped up the stairs. On strict sour milk diet and rest he gained 32 pounds by August 27, 1909, and on that date was perfectly vigorous and well.

Case 11.—Woman of middle age, severe grade of disease. Made recovery in eight weeks under meat diet, with, toward the second month, some fruit.

Case 12.—Man of 40; extreme grade and a long time bedridden. In ten weeks he entirely recovered under milk and fruit alone.

Case 13.—American planter of 30; college athlete of note. Seven years in Porto Rico. Sick since July, 1910. Came under my care November 9 of same year. This case has been very acute and patient has reached an alarming state of marasmus, with all the characteristic signs and symptoms. Placed on sour

Digitized by Google

milk diet and absolute open-air repose. By December 19 he had gained 23 pounds in weight and was entirely well.

Case 14.—A society girl of 21; moderate grade; has been sick one year. Typical signs and symptoms all present but mouth and bowel symptoms predominate, although she has but 60% hemoglobin. First consulted me March 25, 1910, and under strict sour milk diet alone she recovered her normal health by May 17 of same year.

Case 15.—Wife of a sugar planter; 50 years of age; severe grade; has been sick 12 years and developed some mental affection during the course of her disease, for which she was confined in the insane asylum. Had a fairly good recovery in three months under meat and fruit diet.

Case 16.—Unmarried woman of well-known country family; about 35 years of age; disease began eight years ago with "bilious attack" and incessant vomiting which lasts a month. Is now a typical case with 40% hemoglobin. Has made good recovery after a year's treatment with milk, and meat and fruit diet. First consulted me March 2, 1910.

As all of these cases have remained well from one to three years after their recovery, it is only just to state that the cases appear to be permanently cured. Santonin, therefore, if it has any such specific action as that intimated by Begg, does not seem to be superior to a carefully supervised diet, especially a milk diet.

Further investigations may disclose facts not brought out in this simple clinical study, but this preliminary note is offered to attract attention to a very fatal and common disease of this island which I believe is increasing in frequency and which may prove to be infectious in nature.

Digitized by Google

THE WHITE RACE AND THE TROPICS.*

By DR. JUAN GUITERAS,
Director of Health, Habana, Cuba.

I propose in this paper to present some arguments in support of the view that the tropical climate is compatible with the best manifestations of human activity, and that the acclimatization of the white race has, in the Tropics, been successfully accomplished.

The main argument advanced against these views is the high rate of mortality affecting the white race when colonization was attempted in the Tropics; a rate of mortality that has resulted in the extinction of large groups of population.

The examples brought forward are numerous. First among these, perhaps, is the disastrous failure of the French in Panama. It seems to make but little difference that the Americans have wiped out this evidence with success in the same region. The counterproof is not deemed sufficient. It is said that the Americans have not actually colonized; that they have not yet permanently established the white family there. But, I ask, has not the Spaniard established himself permanently in Panama? We shall see more about this when we discuss this subject in connection with the white people of Cuba.

But if the strength of the argument derived from Panama has been sensibly weakened, by the success, more or less complete, of the Americans, still other evident failures of white colonization in the Tropics are brought forward. Among these we may mention the account given by Orgéas of the fatal results obtained by the French in the penal settlement on the Maroni river in the Guayanas; the attempts of the Dutch in the same region; the trials of colonists from Normandy in the West India Island of St. Bartholomew; the evidence of the "poor whites" in Barbados, and the "petits blancs" in the Island of Réunion, and numerous other instances.

---

*Read by title at the Tenth Annual Meeting of the American Society of Tropical Medicine, held at Washington, May 6, 7 and 8, 1913.

Digitized by Google

To-day, as we read the accounts of these disasters, we ask ourselves whether modern methods of investigation would not have shown that it was the ague and the hookworm that destroyed these people, and not the climate?

In the discussion of this subject, especially by European authorities, there seems to have been a marked tendency to ignore the accomplishments of the Spaniards and the Portuguese in the colonization of the tropical regions of America. A misunderstanding as to the meaning of the word *créole,* I believe, has had much to do with this. It has generally been taken to signify a mixture of the white race with the African or with the native Indian, and it has been assumed that the successful colonists were half-breeds. This is a mistake, as we shall show when we come to discuss the situation in Cuba.

The use of the word "natives," without a proper understanding of what it might signify under varying conditions, has also led to confusion. In publications on tropical questions the word "native" is generally employed to denote the negro race or the Indian; and the existence of some millions of white natives of tropical countries is overlooked. The amusing remark is frequently made by visitors from the North, when speaking with an educated Cuban, "But you are not a native, are you?" And the expression of disappointment is quite evident when we answer that we certainly are.

As the fundamental argument of my contention I present the following table of death rates in the Republic of Cuba, for the years from 1902 to 1911. I have adopted the abridged classification of causes of death by Bertillon, extending it in certain groups of diseases in order to bring out such as are of special interest in tropical pathology. Group No. 12, for instance, in the above-named classification, includes "other epidemic diseases." This group I have subdivided as follows: (a) dysentery, (b) plague, (c) yellow fever, (d) leprosy, (e) erysipelas, and 12, other epidemic diseases. So also with No. 37, which includes "other diseases." Some of these have been brought out in separate groups, arranged alphabetically.

Digitized by Google

Vital Statistics of Cuba

Abridged Bertillon Classification (Extended)

	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911
The general death rate is expressed by the ratio of 1 to 1000 of the population. The birth rate is expressed by the same ratio. The infantile death rate is expressed by the ratio of 1 death in the first year of life per 1000 births in the same year. The death rate of the individual diseases is expressed in the ratio of 1 death per 10,000 of the population.	Population 1,757,366 Births 47,091 Deaths 25,512	Population 1,810,889 Births 57,864 Deaths 23,982	Population 1,870,411 Births 58,636 Deaths 25,198	Population 1,929,934 Births 65,965 Deaths 27,345	Population 1,989,457 Births 55,963 Deaths 30,021	Population 2,048,980 Births 66,511 Deaths 34,000	Population 2,125,978 Births 65,367 Deaths 28,361	Population 2,199,859 Births 70,167 Deaths 28,832	Population 2,220,278 Births 76,706 Deaths 33,844	Population 2,297,134 Births 56,798 Deaths 32,065
General death rate	14.5	13.2	13.4	14.1	15.0	16.5	13.3	13.1	15.2	13.9
Birth rate	27.6	31.9	31.3	34.1	28.2	32.4	30.7	31.8	34.5	24.6
Infantile death rate	141	109	124	122	154	163	127	166	140	168
1 Typhoid fever	2.05	1.88	1.58	1.60	1.32	1.69	1.47	1.15	1.24	1.58
2 Typhus fever										
3 Malaria	8.79	6.06	5.76	5.69	5.77	4.51	3.43	3.38	2.77	2.28
4 Variola	.01		.005	.02						
5 Measles	.03	.12	.17	.95	.82	.57	.29	.51	.37	.43
6 Scarlet fever	.08	.69	.47	.33	.29	.15	.22	.09	.08	.09
7 Whooping cough	.06	.49	.58	.48	.80	.66	1.19	.66	.90	.50
8 Diphtheria	.58	.62	.80	.72	1.01	.96	.93	.99	.72	.72
9 Influenza	.92	.60	.85	1.20	.88	2.00	1.18	1.41	2.45	1.73
10 Cholera, Asiatic										
11 Cholera nostras	.03	.02	.02	.09	.01	.02		.004	.009	
12 Other epidemic diseases	.005	.01	.02	.08	.03	.04	.01	.004	.01	.004
12a Dysentery	.86	.46	.25	.32	.38	.39	.15	.15	.19	.23
12b Plague										
12c Yellow fever	.005			.11	.16	.27	.07			
12d Leprosy	.10	.17	.09	.15	.19	.22	.14	.11	.15	.23
12e Erysipelas	.19	.19	.15	.19	.18	.18	.22	.20	.15	.16
13 Tuberculosis of the lungs	20.4	18.9	19.3	19.1	18.3	17.9	15.1	13.4	13.7	13.7
14 Tuberculous meningitis	.44	.45	.47	.58	.60	.52	.41	.37	.27	.32
15 Other forms of tuberculosis	1.82	1.99	1.35	1.55	1.67	1.95	1.13	.95	.81	.80
16 Cancer and other malignant tumors	3.09	3.28	3.53	3.86	4.06	3.96	4.23	4.45	4.46	4.25
17 Meningitis	6.98	6.43	6.85	5.01	4.68	5.84	3.63	4.49	4.65	3.46
18 Cerebral hemorrhage and softening	4.15	3.80	3.61	4.12	3.83	4.40	3.88	3.78	4.22	4.52
19 Organic diseases of the heart	9.27	8.27	8.00	8.80	9.04	10.8	9.55	9.13	10.6	9.73
20 Acute bronchitis	3.06	3.29	4.07	4.11	5.42	5.26	4.44	4.64	5.11	4.35
21 Chronic bronchitis	.48	.39	.55	.76	.81	.68	.54	.65	.96	.91
22 Pneumonia	3.06	2.41	2.25	1.96	1.99	1.72	1.52	1.57	2.62	2.08
23 Other diseases of the respiratory system	2.00	1.81	2.35	1.67	2.21	2.40	1.79	2.11	2.03	2.09
23a Bronchopneumonia	3.15	3.16	3.49	3.08	3.70	4.09	4.22	4.19	5.00	3.71
24 Diseases of the stomach	.35	.48	.76	1.47	1.50	1.12	1.19	.87	1.06	.70
25 Diarrhœa and enteritis (under 2 years)	12.8	10.	12.6	16.9	18.4	29.0	19.9	19.1	27.6	24.9
26 Appendicitis and typhlitis	.16	.28	.20	.27	.37	.37	.35	.30	.27	.38
27 Hernia, intestinal obstructions	.86	.86	1.30	.89	1.06	1.26	1.03	1.07	1.12	1.06
28 Cirrhosis of the liver	1.87	1.75	1.54	1.51	1.56	1.53	1.28	1.42	1.28	1.35
29 Acute nephritis and Bright's disease	3.08	3.04	3.16	3.42	3.64	4.01	3.40	3.54	4.34	4.28
30 Diseases of female organs	.23	.24	.32	.40	.44	.44	.37	.36	.28	.48
31 Puerperal septicmia	.89	.79	.77	.72	.96	.71	.60	.78	.65	.71
32 Accidents of pregnancy & labor	1.02	.98	1.28	1.41	1.55	2.11	1.38	1.34	1.45	1.37
33 Congenital debility and malformations	3.62	4.57	6.18	6.77	8.30	8.34	6.54	6.74	8.45	6.91
34 Senility	1.79	2.15	2.61	3.59	2.93	3.43	2.63	2.89	3.57	3.08
35 Violent deaths	4.10	3.92	3.71	4.18	5.29	4.45	3.87	4.28	4.44	3.68
36 Suicide	1.04	1.13	1.17	1.30	1.37	1.33	1.76	1.67	1.62	1.65
37a Septicmia	.50	.52	.42	.76	.38	.37	.44	.38	.35	.41
37b Glanders	.05	.01	.005	.01	.01	.009	.004	.02	.004	
37c Anthrax	.11	.12	.05	.08	.06	.05	.09	.06	.04	.05
37d Rabies			.005				.004	.03	.02	.03
37e Tetanus	9.11	7.42	7.34	7.11	6.07	5.09	4.67	4.06	3.38	3.32
37f Pellagra	.01	.02	.005	.01	.02			.004	.004	

Digitized by Google

Vital Statistics of Cuba—Continued

The general death rate is expressed by the ratio of 1 to 1000 of the population. The birth rate is expressed by the same ratio. The infantile death rate is expressed by the ratio of 1 death in the first year of life per 1000 births in the same year. The death rate of the individual diseases is expressed in the ratio of 1 death per 10,000 of the population.	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911
Population	1,757,366	1,810,889	1,870,411	1,929,934	1,989,457	2,048,980	2,125,978	2,199,859	2,220,278	2,297,134
Births	47,091	57,864	58,636	65,965	55,963	66,511	65,367	70,167	76,706	56,798
Deaths	25,512	23,982	25,198	27,345	30,021	34,000	28,361	28,832	33,844	32,065
37*g* Beri-beri									.004	.008
37*h* Syphilis	.29	.27	.33	.39	.31	.37	.33	.29	.31	.34
37*i* Gonococcus infection	.005	.005	.005	.01	.01	.009	.004	.009	.008	.01
37*j* Poliomyelitis, acute anterior										
37*k* Encephalitis	.56	.59	.72	.57	.50	.57	.67	.35	.40	.39
37*l* Convulsions of Infants	.53	.44	.78	.98	1.06	1.07	.92	.83	1.05	1.05
37*m* Pericarditis, endocarditis	1.27	1.18	.98	.84	.94	.85	.67	.84	.84	.77
37*n* Angina pectoris	.46	.45	.52	.49	.73	.87	.74	.76	.97	.71
37*o* Diseases of the arteries	4.52	4.74	4.38	4.61	5.94	6.20	4.19	4.17	5.87	5.35
37*p* Diseases of veins, embolism	.46	.33	.35	.26	.37	.67	.63	.44	.71	.37
37*q* Diseases of lymphatics, Filariasis	.03	.02	.03	.01	.04	.01	.05	.05	.04	.05
37*r* Diarrhœa and enteritis (2 years and over)	5.44	3.68	4.10	5.30	6.47	8.26	6.11	5.61	7.82	7.97
37*s* Ankylostomiasis									.05	.09
37*t* Malignant jaundice	.22	.14	.12	.17	.11	.01	.09	.10	.07	.08
37*u* Other diseases of the liver	1.14	1.08	1.02	.86	.98	.82	.83	.75	.75	.81
37*v* Infectious fever	.87	.84	.46	.47	.39	.29	.34	.30	.25	.30
37*w* Gangrene, acute abscess	.59	.49	.50	.55	.56	.64	.52	.55	.66	.55
37 Other diseases	9.20	8.31	8.11	7.77	7.72	7.33	6.06	6.29	6.21	6.32
38 Unknown or ill-defined	6.81	4.98	2.47	2.46	2.99	2.89	2.30	2.30	2.81	2.15

This table certainly does not represent the death rate of a dying population, but rather of one that is very much alive. The general death rate reaches a very low figure and one that compares favorably with those of the best organized countries in any latitude.

I have prepared similar tables for every one of the 103 municipal districts into which the Island is divided. If space allowed I could show remarkably low rates of mortality for groups of diseases in various districts. These will be the subject of special papers to be published in our "Boletín de Sanidad y Beneficencia."

I should state, however, that in the year 1912 the general death rate per 1000 of population was 13.55, and that the said death rate stood below 10 in 23 of the municipalities. In the year 1911, 2 of them had a death rate below 3, and in 1912 the death rate in the same districts was less than 5 per 1000 inhabitants.

Digitized by Google

We should remember that the elevation of the land in Cuba is nowhere sufficiently high to bring about conditions that belong to the temperate or even the subtropical zone.

The infantile mortality is, however, lower in some, and higher in other countries of the temperate zone. This mortality may be said to stand on a level with that of other countries of high birth rates. The birth rate in Cuba, for 1912, was 33.89.

The death rate from pulmonary tuberculosis, as may be seen in the table, is steadily falling. The highest for the year 1912 was 29.08 per 10,000 population, in the City of Havana; but there were 16 municipalities with death rates below 5 per 10,000 from this cause. Mantua, a tobacco growing district in the western end of Cuba, with a population of over 11,000 inhabitants, had no death from this cause in 1911, and one in 1912.

A very interesting fact has been shown in the study of the distribution of tuberculosis throughout Cuba. I find the death rate from this disease higher in the central plateau than along the sea border. And this in spite of the fact that our larger cities are mostly seaport towns. An average of the death rates obtained for the municipalities bordering on the north coast for the years 1911 and 1912, was 9.56; for those bordering on the south coast it was 9.30; whilst the inland municipalities presented an average of 11.17 per 10,000 of population.

Infantile diarrhea is most irregular in its distribution as regards time and place, displaying remarkable variations of the death rate in several places from year to year. As far as I can see, all efforts to obtain an explanation of the variations of this obscure disease are baffling. It is of interest to mention that milk used in Cuba is always boiled.

With respect to malaria, I would state that in the year 1912 there were 35 municipalities in which no deaths occurred from this cause, and that only 11 of them had a death rate above 5 per 10,000 inhabitants.

In the same year (1912) there were 33 municipalities without deaths from typhoid fever, and in 29 others the death rate was below 1 per 10,000 of population.

Returning now to a more direct examination of our problem of the adaptation of the white race to the Tropics, I should state

Digitized by Google

that the colored population of Cuba is, as compared with the whites, slowly diminishing. There are no Indian aborigines nor halfbreeds of this race.

According to the census of 1899, the proportion of blacks to whites in the general population was as 1 : 2.11. According to the last census, 1907, the ratio of blacks to whites was as 1 : 2.30. There is, therefore, a slight increase from one census year to the other of the white population over the colored. This is in part due to the higher death rate of the latter. It cannot be said, therefore, that the low death rate that we have noticed above as existing in Cuba, is due to the presence here of blacks and mulattoes who might be regarded as better adapted to the fancied severities of a torrid climate.

The ratio of the number of deaths of the colored to the number of deaths of the whites, shows a smaller proportional difference than the ratios of the respective populations. This ratio of deaths of colored to whites, in the census year of 1907, was as 1 : 1.86; in the year 1912 it was as 1 : 2.01. Almost exactly one-third of the deaths in this year belong to the colored, whereas the colored population is less than one-third of the whole population.

I wish to bring out these features because the idea is rife that the successful implantation of the white race in certain regions of the Tropics is only apparent; and that the struggle of the whites against adverse climatic conditions can only be successfully waged through one or both of the following means: (1) the intermarriage of the whites with the native Indian or the African colored population; (2) the frequent introduction of fresh white elements from the temperate zone.

In Cuba we are able to advance very strong arguments against either of the above views. For instance, the highest proportion of whites in Cuba is to be found in the Province of Camagüey, and according to the census of 1907, the ratio of blacks to whites in that province was as 1 : 4.46. Camagüey consists mostly of extensive plains favorable to stock raising. Sugar cane fields and coffee plantations, with their necessary accompaniment of negro slave labor, do not enter into the industrial life of the province. On the other hand, the absence of any im-

Digitized by Google

portant towns along the coast of this province, and its isolation from the rest of the Island up to the recent date of the construction of the Cuba Company Railway, made this section of the country the one least open to immigration. In 1907 the ratio of foreign whites to native whites in this province was as 1 : 11.9, a proportional difference which is above that of any of the other provinces. Now, the interesting fact in connection therewith is that this province, with a minimum of intermixture of the white and black races, and with a minimum of importation of a new white element from abroad, presents the finest type of the white race in Cuba; the people of this province are rather tall, handsome, often fair-eyed, with fine sunburned complexions and dark hair. Though the number of the population is below that of the other provinces, Camagüey has contributed its quota of men of action and high intellectual attainments. There we find also the largest families on the Island. The average size of the family in Camagüey is 5.5. For the native white family it is 5.8, and for the white foreign and the negro families it is 5.0. In the rest of the Island it is lower. The minimum is reached in Matanzas, with 4.2. In many of the families of Camagüey the Spanish ancestor has to be sought several generations back. In the Province of Camagüey the mortality is low and the birth rate high, 38.6 for the year 1912. The death rate in 1912 was 11.15. The Province of Pinar del Rio is the only one presenting a lower figure, 10.25, but its birth rate is low, 22.8 for the year 1912. The Province of Camagüey also presents the highest death rate from old age.

But it is not alone in Camagüey, but everywhere throughout the Island, in the rural as well as in the urban districts, that we find the Cuban family. In cities they easily reconcile themselves to the environments of the highest civilization; in the country they are a hardy race of medium stature, dark complected, lean, frugal, and industrious. These latter work two crops a year from a fertile soil.

It is a problem well worth careful study by the expansionists of the Anglo-Saxon, Teutonic and other European families to learn in what manner the Spaniard has accomplished this successful colonization of the Tropics. The fact that Spain was

Digitized by Google

found to be, at the end of the nineteenth century, governing her colonies with an utter disregard of the dictates of modern hygiene, should not blind us to the results obtained by her powerful and civilizing initiative in the earlier days of the settlement of the New World. The problem is certainly a complex one, and sufficiently interesting to invite suggestions as to some of the factors that may have contributed to the results obtained.

There are some marked differences in the mode of living of the Spaniard and the English in the Tropics; differences that are perhaps not as striking to-day as formerly. The Spaniard maintained, with regard to his dwelling, the Moorish traditions of Andalusia. He defended himself against the heat by shutting himself up; he was afraid of the air, especially the night air, but this fear did not possess the Englishman. The Spaniard erected spacious structures with thick walls and large openings for doors and windows, but these were always kept closed, excepting some small wickets.

We say in Spanish, "el español es enemigo del árbol"—the Spaniard is an enemy of the tree. He certainly was not fond of the dense shrubbery and foliage that we frequently see about English habitations in the Tropics. The bare aspect of the huts of Cuban peasantry is rather a striking feature of the landscape there. The huts of the negroes in Jamaica, and even at the eastern end of Cuba, are, where the influence of the French planters from Santo Domingo is noticeable, often densely shaded by luxurious vegetation.

May we not suggest that these differences in the ways of living in a measure protected the Spaniard against the anophelines and malaria?

Another striking difference between the two stocks of the Caucasian race has been the abuse of alcohol by the more northern families.

In conclusion, a few words with respect to the actual display of energy made by the white race, or other races, in the Tropics. I believe that general opinion has been misguided by preconceived notions. I was born in Cuba, of Spanish descent, and Cuban parents of the white race. I have lived more than half of my life in the temperate zone, and during that time worked as

Digitized by Google

hard in the cold country as in the southern land, and in view of my experiences I am convinced that the capacity for work is the same in both latitudes. The Cuban is active, lively, and talkative. His speech is accompanied by an extraordinary display of gestures which keep his features and his limbs in constant exercise. This may be misdirected energy, without corresponding results, perhaps, nevertheless it is energy. The Cuban mother, white or black, devotes the same ceaseless tension of purpose to the care of her child as may be seen in any climate; and the Cuban child is endowed with the same mercurial, inexhaustible mobility of children everywhere. If there be doubters, I would invite them to watch him play ball in the torrid sun. He goes north and he may be a great ball player, or at school he will often stand with the best. The peasant is a light sleeper, and he works the fields the whole year. We should not forget that Cuba, with a population a little over two million inhabitants, exports products of her soil and her industries at the rate of over $110,000,000 a year.

The country doctor? He is abroad here also with his ceaseless toil, devotion and kindness. I saw him, not long ago, riding on horseback into a country town from his professional rounds. He had pneumonia; his temperature was 104°. He was delirious, and called on the passers-by to stop his horse, which he supposed was running away with him. He was dead within three days. May he rest in peace.

And what do we find in the pages of history? The Spanish conqueror displayed, in the tropical countries of America, often in the low and hot lands, a degree of energy which he never equalled in his European struggles and achievements.

Great civilizations had their birth in the Tropics. The most modern of these, the Islamic, astonished the world with the splendor of its intellectual florescence, and the wonderful aggressiveness of its sway.

At the present writing, one of the great achievements of the race is being brought to its termination in the tropical land of Panama. White men and black have labored together there, and leading spirits of the Anglo-Saxon race have found, in the tropical jungle, the great opportunity that might never have come

Digitized by Google

to them in their northern home; and climate was no bar to the fulfillment of the great purpose.

The stranger in the Tropics lacks generally the constant stimulus leading to successful performance which spurs him on in his native land, and he yields readily to the preconceived notions that prevail with respect to the depressing influences of the climate. You will find him, then, fretting, growing excited over the insupportable heat, and complaining loudly when others around him may be quietly attending to their work. Under these conditions he often fails to resist the debasing influences of the lower moral environment which is apt to surround the newcomer, away from the restraining influences of the family ties, and the pride of place and name. To such evil influences we may add, sooner or later, the effects of various diseases that are neither telluric nor climatic, but simply parasitic and, therefore, entirely preventable.

The physiologist and the hygienist have not been able to point out any alteration in the metabolic processes of the human body in the Tropics; they observe merely an adaptation of the heat-eliminating function of the skin; an adaptation which is altogether physiologic and compatible, therefore, with all degrees of human activity.

The proper motives, the proper channels of energy, are generally lacking or misdirected at the present time in the white communities of the Tropics. They are just beginning to conquer the diseases that have contributed to place them, for the time being, on a scale of relative inferiority. But the great reservoir of energy that has found its expression in such characters as Alexander Hamilton, Charles Finlay, Toussaint-Louverture, is fortunately extant.

Digitized by Google

TRANSACTIONS OF THE AMERICAN SOCIETY OF TROPICAL MEDICINE

Tenth Annual Meeting of the American Society of Tropical Medicine, 1913.

During this meeting of the Society, a symposium, in which various members of the Society participated, was a feature of the scientific proceedings. The JOURNAL presents the following outline of the discussion.

IS THE IMPORTANCE OF INTESTINAL PARASITES IN TROPICAL PATHOLOGY EXAGGERATED?

Secretary's Abstract, by John M. Swan, M. D., Rochester, N. Y.

Dr. Edward R. Stitt, Washington: There have been so many confusing statements made concerning the importance of intestinal parasites in tropical pathology that it seems that valuable results might be gained by a general discussion of the subject. Some writers take the ground that intestinal parasites are of no importance. On the other hand, the reduced death rate in Bilibid Prison from 75 per 1000 to 9 per 1000 after quarantining of persons harboring intestinal parasites, seems to indicate that there is some importance to be attached to their presence.

Dr. Creighton Wellman, New Orleans: Many men working in the Tropics underestimate the importance of intestinal parasites, and some probably overestimate their importance. The idea that they amount to nothing is wrong. It would at first seem necessary to define what is meant by the question. Whether it applies to metazoan parasites alone or whether it includes protozoa as well as metozoa. Some years ago I investigated a disease which occurred among the fishermen of Western Africa. This disease was characterized by a severe anemia and was attended with a high mortality. It was found to be due to *Dibothriocephalus latus*. In one district in West Africa 13% of the population was incapacitated by uncinariasis. The activities of the Rockefeller commission have been highly beneficial in relation to hookworm disease. In highly malarious countries the presence of intestinal parasites affects the mortality in two ways. The presence of hookworm infection increases the mortality from malaria; but, on the other hand, overzealous treatment of hookworm disease increases the mortality from malaria. Amebiasis is an important factor in the morbidity and mor-

Digitized by Google

tality in the Tropics. On the other hand, some parasites have been taken too seriously, such as *Strongylis subtilis*, *Hymenolepis nana*, *Trichuris trichiura*, etc. It is possible that heavy infections with these parasites produces some anemia. In some districts in the Tropics, 100% of the children suffer from *Ascaris* infection. This worm produces convulsions and even stimulates recrudescences of malaria. It is a difficult question to answer catagorically; but I believe the importance of intestinal parasites is not exaggerated. Neglect of routine examination for intestinal parasites is reprehensible.

Dr. Henry J. Nichols, Wshington: The importance of helminths is exaggerated. It is easy to discover an infection with intestinal worms; it requires no skill or special knowledge. These parasites have not the serious influence that other parasites have, because they cannot reproduce themselves in the intestines. Intestinal worms are limited in their capacity for pathogenicity. As a general rule, it may be said that intestinal parasites are injurious in inverse proportion to their size and that intestinal worms are of the least importance. The helminthologists have emphasized the importance of these parasites, but their bearing on clinical medicine is not apparent. In the Tropics a man is likely to suffer from infection with four or five parasites, and the relative importance of these infections must be decided by the clinician. He should be able to recognize the various worms and their possibilities for harm to the organisms. In some instances endeavors have been made to convince well people who have been discovered to harbor intestinal parasites that they are sick. Of course the intestinal parasite has been used as a text for agitation in order to interest the public and legislators in necessary public health measures. For this purpose, it is perhaps necessary to exaggerate the importance of the parasites. On the other hand, it is not necessary for medical men to accept this exaggeration.

Dr. Charles F. Craig, Washington: It is exceedingly difficult to give a categorical answer to the question of the importance of intestinal parasites. The conditions vary in different localities. In the Porto Rico Islands, for example, the importance of the hookworm is not exaggerated. The only intestinal worm of great importance in tropical pathology is the hookworm. *Schistosomum* is important; but its locale is limited and the number of cases is small. The whipworm and *Strongyloides* are of no importance whatever. Cochin China diarrhoea is not due to *Strongyloides* infection. *Ascaris* is of no importance. In the Philippine Islands hookworm infection is light and has little to do with the sickness of the natives. We might say that in Porto Rico one has hookworm disease; but that in the Philippine Islands one has only hookworm infection. In the Southern part of the United States, the importance of the hookworm is exaggerated. The great stress laid upon the influence of intestinal parasites takes no account of other infec-

Digitized by Google

tions, like malaria, which have more influence on the morbidity than uncinariasis. The hookworm campaign has improved the health of the people in districts in which there is no malaria, but there is a question whether anything has been accomplished in districts in which malaria is present. Leaving amebiasis and other protozoa out of the question, I am inclined to believe that the importance of intestinal parasites in tropical pathology is exaggerated.

Dr. Edward R. Stitt, Washington: In cases of hookworm disease finding of the ova in the feces very frequently puts the clinician off the track. When the eggs of this parasite have been found in the stool, the clinician is prone to think that the cause of the disease has been discovered, and it takes a long time to get over the idea. I have noticed that in the southern part of the United States, men interested in tuberculosis take the tuberculosis attitude rather than the hookworm attitude. While on the other hand men interested in hookworm take the hookworm attitude to the exclusion of tuberculosis or other infections.

Dr. Philip E. Garrison, New York City: The importance of intestinal parasites in tropical pathology is exaggerated. The subject has not been sufficiently studied from the point of view of relative importance, and it is time that an attempt was made to determine the position that the various parasites occupy in their power to produce disease. It is sometimes remarkable how a bacteriologist, for example, will go into a new field, use his own methods and expect certain results. A bacteriologist cannot see the reason for investigating intestinal worms, which are common, while he can see the use of investigating rabies, which is very rare. Intestinal worms are of importance in public health work, although we do not know just what their importance is. For a discriminating view further study of the subject should be encouraged. The relative importanee of malaria and uncinariasis in the South should receive careful study. A hookworm carrier is as potential for the spread of hookworm disease as a typhoid fever carrier is for typhoid fever. The movement to make the hookworm campaign world wide is thoroughly scientific. In the discussion of the entire subject we must be careful not to confuse the zoological side with the public health and preventive medicine side of the subject. I strongly urge that further discriminating emphasis be placed upon the subject so that a proper conception of its true significance may be obtained.

Dr. John M. Swan, Rochester, New York: I recall two cases of chronic arthritis in which I thought the presence of intestinal parasites was responsible for the joint conditions. One of these patients was a boy, ten years old, a resident of Florida, who had a low-grade multiple arthritis of the finger joints. On examining the feces, hookworm ova were found. The removal of the intestinal parasites improved the joint condition, but did not cure it. In another patient, who had spent con-

Digitized by Google

siderable time in the Far East, an examination of the feces showed numerous *Ascaris* eggs. I told the patient that intestinal parasites were probably responsible for the arthritis; but was much chagrined to find only one unimpregnated female in the intestine. The removal of this parasite did not benefit the joint condition. We must not be too sure, however, that infection with similar harmless parasites is not productive of serious disease. Some years ago a paper on trichocephaliasis appeared in the Philippine Journal of Science in which a case was recorded of plugging of one of the coronary arteries by an adult *Trichuris*. It has occurred to me that a good many obscure disturbances of health are brought about by the presence of intestinal worms, when the parasites first gain entrance to the intestinal tract; but it is likely that after they have been present for a varying period of time a certain amount of immunity is developed by the host. I have often thought the development of this immunity influenced the eosinophilia.

Dr. Brayton H. Ransom, Washington: From the standpoint of the helminthologist the question should read: Is the importance of intestinal parasites overestimated? The answer to this question depends much upon the local conditions. We are less informed regarding the importance of intestinal worms in animals than we are of their importance in man. At the present time it is impossible to say that any intestinal parasite is of paramount importance in relation to animal disease.

Dr. Weston P. Chamberlain, Plattsburg Barracks, New York: A question such as that propounded for this discussion cannot be answered categorically. Some authors have exaggerated the importance of intestinal parasites and some have underestimated their importance. As a whole, it is probable that their importance has not been exaggerated. The subject needs further careful attention until the relative values of the different infections are understood. There is a great deal of difference between light and severe hookworm infection. The importance of these infections in the Philippine Islands is apparently not great. As I have reported elsewhere, the polymorphonuclear leucocytes are reduced in the blood of white men residing in the Philippine Islands. The Arneth formula is the same in white men in the Philippine Islands as in the United States. In the native, on the other hand, there is a distinct shift to the left in the Arneth formula. This seems to be due to the lowering of the resisting power of the individual. The cause, however, is unknown, but it is worthy of further research.

Dr. Elmer F. Otis, Peñuelas, Porto Rico: In Porto Rico it does appear that infections with intestinal parasites produce a physical, vital, and nervous effect that classifies children, particularly, as deficient. Other intestinal parasites appear to produce a toxemia.

Digitized by Google

NEWS AND COMMENT

On June 7, the centenary of the birth of David Livingstone was held at Livingstone College, London.

At the last meeting of the London Society of Tropical Medicine and Hygiene, eleven Fellows were elected.

Deaths of several physicians in China from typhus fever are reported, among whom are Drs. Hart, Jenkins and Robertson, and Professor Knight of Cheng-tu.

The degree of Doctor of Public Health was conferred June 26 upon Dr. Rupert Blue, Surgeon General U. S. Public Health Service, by the University of Michigan.

Reports from the northern and central provinces of China show that smallpox and typhus fever have prevailed during the last few months over a very wide area.

Surgeon-general Joseph E. Godfrey, chairman of the Local Government Board of British Guiana, has been reappointed to serve on the Executive Council of that colony.

Captain J. F. Siler and Mr. W. J. Jennings, of the Thomson-McFadden Pellagra Commission, have proceeded to Texas to take up further epidemiological studies on pellagra.

A Board for the Study of Tropical Diseases has been organized by the Medical Department of the Army at Ponce, Porto Rico, and Major Bailey K. Ashford has been appointed President of the Board.

Dr. Robert Earl Swigart, General Superintendent of the United Fruit Company's Medical Service, has been elected Professor of Tropical Sanitation in the Tulane School of Hygiene and Tropical Medicine.

Digitized by Google

In recognition of his valuable services in the reorganization of the Red Cross Society in China, a silver medal has been presented to Dr. R. H. Bolt, of the Tsing-Hun Medical College in Peking.

Dr. Andrew Balfour has been appointed Director in Chief of the New Wellcome Bureau of Scientific Research. His place as Director of the Wellcome Tropical Research Laboratories at Khartoum has been filled by the appointment of Dr. A. J. Chalmers, of Ceylon.

The dinner of the Section of Tropical Medicine and Hygiene of the International Medical Congress and of the Society of Tropical Medicine and Hygiene of London, was held at the Trocadero Restaurant, London, on the evening of August 8. Surgeon-general Sir David Bruce presided.

At the last meeting of the German Society of Tropical Medicine, only the business portion of the program was carried out, it having been decided to postpone the scientific part of the program until the next meeting, which will be in London in conjunction with the International Congress of Medicine.

It is said that the arrangements for the organization of the Calcutta School of Tropical Medicine are so far advanced that the School may confidently be expected to open next year with ample laboratory accommodations for research workers and generous clinical material in the hospital of the College, of which the School is a part.

Sir Jonathan Hutchinson died at his home in Haslemere, England, June 23. He was 84 years old. Among the works of this preëminently distinguished clinician which are of interest to students of tropical medicine are his numerous contributions to the elucidation of the etiology of leprosy. Sir Jonathan maintained with all his brilliant ability the thesis that leprosy is due to fish eating.

Dr. Paul Marchal, chief of the Entomological Bureau of France and member of the French International Commission

Digitized by Google

for the Study of Malaria, has been touring the United States under the guidance of Dr. L. O. Howard, Chief of the Bureau of Entomology, and Dr. W. D. Hunter, of the same Bureau, with the object of studying methods of economic entomology in this country. Dr. Marchal has expressed great interest in work along lines of medical entomology as carried out in the United States.

Dr. Creighton Wellman, Dean of the Tulane School of Hygiene and Tropical Medicine, sailed Saturday, August 2, for Central and South America, where he will visit the United Fruit Company's hospitals and stations, at the request of Dr. Robert E. Swigart, Medical Superintendent of the Company. Dr. Wellman will study and report upon the tropical conditions at Ceiba, Puerto Barrios, Port Limon, Tela, Bocas del Toro, Santa Marta, Jamaica and other districts occupied by the United Fruit Company's Medical Service.

In a personal communication to the Editor of this JOURNAL, Dr. E. M. Dupaquier states, regarding the administration of emetine hydrochloride in amebic dysentery, that half-grain keratin-coated tablets should be continued six weeks after the paroxysm has been met by hypodermic administration, with a view of preventing relapses. A patient has been able to do so without ill effects and with excellent results, taking three, two and one tablets a day, decreasing weekly, guided by the nauseating feeling. He has never felt so well since the onset of his infection, four years ago.

Major P. M. Ashburn, the President of the U. S. Army Board for the Study of Tropical Diseases, in the Philippines, has been relieved from that duty and ordered to Ancon, Canal Zone, for the purpose of organizing an Army Board for the study of the tropical diseases of the Isthmus of Panama. It is expected that the new Board will devote its attention wholly to the study of the tropical diseases present in the Canal Zone and on the Isthmus, and that it will receive the cordial support of the War Department. The Philippine Board, since its establishment in 1906, has accomplished much important work in the elucidation of the diseases of the Philippines and has shown the

Digitized by Google

wisdom of the establishment of such research boards by the War Department.

The Medical Department of the Army has commenced the publication of a series of Bulletins that will contain papers by officers of the Department upon various subjects. Two numbers have already appeared, the first an atlas of photomicrographs of the protozoa, with explanatory text, and the second, the text of all papers read before the Fifteenth International Congress of Hygiene by officers of the Medical Corps. A third number is now in the printers' hands, entitled "Studies of Syphilis," by Captains Craig and Nichols, of the Corps, devoted to the diagnosis and modern treatment of the disease and containing data covering the experience of army medical officers in the use of Salvarsan and other methods of treatment. It is expected that the various reports of the Army Boards of Tropical Medicine, the research work carried on in the Division Laboratories of the Army, and by individual medical officers, will be published in the Bulletin as material becomes available.

The Section of Tropical Medicine and Hygiene of the Seventeenth International Congress of Medicine is in session at our time of going to press. There has been announced a most interesting program, including discussions of plague, beri-beri, sanitary organization in the Tropics, Leishmaniasis, relapsing fever, the prevention of malaria, yaws, dengue, phlebotomus fever, schistosomiasis, the danger of yellow fever from the opening of the Panama Canal, the difference between the cholera vibrio and the El Tor vibrio, blackwater fever, and the blood parasites of birds. Among those who are announced to take part in the discussions and to read papers are Drs. Kitasato, Liston, Simond, Eijkman, Nocht, Schaumann, Funk, Hehir, Hintze, Ross, King, Plehn, Simpson, Sergent, Laveran, Nattan-Larrier, Nicolle, Leishman, Lavaditi, Novy, Balfour, Darling, Castellani, Craig, Doerr, Katsurada, van Loghem, Stephens, and von Wasielewski. The Secretary of the Section is Dr. A. W. G. Bagshawe.

Digitized by Google

CURRENT LITERATURE

Filterability of the Virus of Trachoma.—(Pathologica, v, 107, April 15, 1913, p. 1088.) E. Bertarelli claims the priority of first demonstrating the filterability of the virus of trachoma. He states that his first success was achieved in 1908 and points out that the work of Nicolle, Blaizot and Cuénod are to be regarded as confirmations of his discovery.

Creighton Wellman.

Properties of the Virus of Trachoma.—(Comptes Rendus Acad. Sci., clvi, April 14, 1913, p. 1177.) C. Nicolle, Cuénod and Blaizot state that the virus of trachoma, secured by the curetting of the conjunctivae of individuals suffering from the disease, is destroyed by heating for 3 minutes at 50° C. It may be preserved for seven days in glycerine.

C. W.

Immunity in Trachoma.—(*Ibid.* p. 1178.) Nicolle, Cuénod and Blaizot experimented with monkeys (*Macacus inuus*) and found that an immunity against the disease can be established. By repeated intravenous inoculations of the virus of trachoma a *Macacus* monkey was rendered immune to experimental infection. A chimpanzee was not protected by such intravenous inoculation. Trachoma in man is, according to these authors, ameliorated by intravenous inoculations of the trachoma virus. No ill effects were observed from the inoculations. Subconjunctival inoculations, likewise harmless, were also tried with benefit. C. W.

Parallelism Between the Cholera Vibrio and the El Tor Vibrio.—(Centralb. f. Bakt. I, Orig. lvii, 6, 1913, pp. 410-419.) J. J. van Loghen found in gelatin plates to which had been added 10% of goat's blood, that after 48 hours the El Tor vibrio produced hemolysis, while the true cholera vobrio did not. He concludes that the group of El Tor vibrios are to be separated from the group of true cholera vibrios and that the El Tor epidemic should not be considered true Asiatic cholera.

C. W.

Relapse in Malarial Infections.—(Journal of Infections Diseases, xii, 3, May, 1913, pp. 277-325.) W. M. James goes into the etiology of malarial relapses with great detail in this article, taking up the subject in its many aspects. His definition of relapse is interesting and is as follows: "A return of the fever and parasites after the former has ceased and the latter have disappeared from the peripheral blood, reinfection being excluded. I do not include those cases in which quinine has not been administered in doses sufficient to clear the peripheral

Digitized by Google

blood of parasites. Such cases are not true relapses, for the original infections are only diminished." James accepts the hypothesis that the asexual cycle alone is the cause of the relapse and under certain conditions takes on a relative immunity against quinine. He believes that this doctrine explains satisfactorily the following crucial factors in the problems, viz.: the frequency of relapse, the fact that relapse so often follows so-called spontaneous cures of malaria and also insufficiently treated cases, and the fact that relapse more seldom follows vigorously treated infections. When a relapse occurs during quinine administration, according to the author, faulty absorption of the drug exists. The asexual generation will in time die out if the patient's vitality is sufficient, even if no treatment is given, and the disease end spontaneously. It is easier to cure the infection in vigorous persons as the natural forces of the body aid the action of quinine. The notion of relapses being due to asexual forms of th parasite also depends, according to James, upon the following facts: quinine by the mouth very often does not kill the asexual forms in the marrow and spleen and the remaining parasites become resistant and the longer the asexual cycle persists the more easily it becomes immune to the drug. The greatest bearing of this hypothesis is upon the treatment of malaria. Small doses even in mixed infections, only render the asexual cycle resistant so that increased doses, which might have been effectual early in the attack, become useless. C. W.

Antagonistic Substances of Experimental Polyneuritis.—(Archiv f. Schiffs-und Tropenhyg., Heft 10, 1913.) C. Eijkman states that Funk was the first (1911) to succeed in obtaining in a pure state from suitable diet, the principle that counteracted experimental *Polyneuritis gallinarum*. He isolated from rice bran and also from other foods a nitrogenous organic substance that was free from phosphorus, which is capable in daily doses of 20 to 40 milligrammes of restoring to health in a short time, pigeons that have grown sick on polished rice. According to Funk, the substance in question, which he styled *Vitamine*, has the formula of $C_{17}H_{20}N_2O_7$, which probably belongs to the pyramidin group. Funk later showed that other members of the pyramidin group, and also some purin bodies, can mitigate the polyneuritis, and put off the fatal termination, though not able entirely to cure the disease. Dr. van Hoogenhuyze, in Eijkman's laboratory, has extracted a crystalline substance from an extract of rice bran. This substance, in repeated daily doses of 20 to 40 milligrammes, injected hypodermically in doves diseased by a diet of polished rice, had a decidedly curative action. The cramps quickly ceased, the lustreless plumage soon brightened up, the animals became more comfortable, and, of their own motion, began to eat rice again. Only the paresis lingered a while, but usually in 5 or 6 days this was replaced by mere weakness. Despite the occurrence of a few failures the authors claim that the many positive results lend weight

Digitized by Google

and conclusion to the experiments. It was at first supposed that this crystalline substance was the same as Funk's *Vitamine*; but it was later shown that it contained a large proportion of mineral matter. It lost by heating only 6.6% of its weight, and the ash acted on diseased doves exactly the same as the raw substance. An analysis of the ash gave 84% of chloride of potassium, and the rest was sodium chloride, with traces of phosphoric acid, calcium and sulphuric acid. There was no iron, no manganese, nor magnesium. Furthermore, equally good results were obtained in sick pigeons by using a mixture of chemically pure potassium chloride and sodium chloride, in the proportion of 3 to 1, and in doses of 20 to 40 milligrammes, as were obtained with the previously mentioned preparation obtained from rice bran. It is worthy of note, however, that the substances mentioned left the investigators in the lurch when it came to using them on chickens. Correspondingly larger doses were given, but in seven hens no favorable results were obtained. A. McShane.

Epidemic of Beri-beri Among Japanese Fishermen.—(Archiv f. Schiffs-und tropenhyg., xvii, 9, 1913, p. 306.) J. Tsuzuki, head of the Beri-beri Institute in Tokio, says the waters around the Tsishima Islands, lying between Tesso and Kamsahatka, abound in fish, and are usually visited by large numbers of fishing boats during the summer. The author, in reporting an epidemic of beri-beri in 1912 among the fishermen, calls attention to the great value of anti-beriberin as a curative agent. Tsuzuki observed that the mortality of the disease was greatest among those who used white rice exclusively as a diet. After citing quite a mass of detailed information as to the outbreak of the disease and its extension among the Japanese fisherfolk, the author comes to the conclusion that the disease is due to a preponderant rice diet. In order to check the disease he recommends a mixed diet of barley and rice, increased consumption of fresh vegetables and administration of anti-beriberin as an immunizing as well as a therapeutic remedy.

A. McS.

Pellagra Produced in a Monkey.—(Southern Medical Journal, vi, 7, July, 1913, pp. 483-484.) W. A. Dearmon reports that he has produced in a monkey symptoms typical of pellagra, by feeding tissue and saliva from a case of human pellagra. The incubation period was 37 days. The symptoms were anorexia, emaciation, prostration, diarrhea and characteristic skin lesions involving the fingers, lower portions of the forearms and elbows. The monkey died 19 days after the onset of the symptoms. Autopsy revealed congestion and superficial necrosis of the intestinal tract, with engorgement of the mesenteric vessels, the colon, sigmoid and rectum containing a copious exudate. Cultures were made from the feces of the animal and a bacterium isolated. This organism probably belongs to the colon group. The monkey's serum

Digitized by Google

agglutinated the organism in dilutions of 1-100. Serum from healthy monkeys and men do not agglutinate the culture. The author considers that pellagra is an infectious disease, primarily a gastro-intestinal disorder, caused by a specific organism which he believes he has isolated.

Creighton Wellman.

The Cultivation of Plasmodia and Piroplasma in Vitro.—(Archiv. für Schiffs-und Tropenhygiene, Bd. 17, No. 11, 1913.) H. Ziemann mentions the work of Coronadi, Plehn, Laveran and others in attempting to cultivate parasites and finds that he cannot confirm them. Experiments with leeches were of little value. Nothing could be seen of the parasites after five days. The work of Bass and Johns gave impetus to further experimentation, by which he not only confirmed Bass's results, but introduces some slight modifications into the technique. The author found that the addition of more dextrose gave better results. He recommends strongly inactivating the serum. The layer of malaria blood is ½ cm. thick and the culture held at 37° till segmentation is about to occur, when the tubes are put into the incubator at 40°. The cultures seem to succeed best when leucocyte free blood mixed with dextrose is placed in the bottom of the culture tubes and on this the layer of malaria erythrocytes. The author recommends that the blood for culture be taken during the period of apyrexia, with the aestivo-autumnal type, when the larger ring, and seal-ring shaped forms, are most prevalent. He had success with both tertian and aestivo-autumnal type of parasites. Of the former he found evidence of proliferation after 6 days. Forty degrees C. was the optimum temperature, 40-48 hours the incubation period necessary for sporulation. He succeeded in obtaining three generations. Half moon forms in six-day cultures showed no tendency toward parthenogenesis. Tertian parasites develop best at 39.5° in 34-36 hours. The author could not follow the development beyond the second generation. Besides the normal forms of the parasites, many transitions such as are seldom to be seen in peripheral blood of patients, were noted. Serums other than human, active and inactivated, as well as ascitic fluid, were experimented with. The author expresses the opinion that the method would find practical application in cases where the diagnosis of malaria is doubtful. He also supposes that the dextrose may cause the red cells to stick together in such a manner as to allow of a better adhesion between them and the parasites. Calcium salts, according to Bass and Johns, here play some part in the haemolysis of red cells, and the author concludes that the cessation of haematuria in black water fever, with continuation of fever, on change of water supply, may be analogous phenomena. Bass's conclusion that the cultures can be carried on *ad infinitum* without a sexual phase requires substantiation.

In attempting to culture *Piroplasma*, author tried the method of Bass—without results until he took dogs in which the disease had not

Digitized by Google

made great progress, but those in whose peripheral circulation the parasites had just begun to appear. He recommends splenectomy and removal of the blood three-quarters of a day later. He diluted the *Piroplasma* blood with ascitic fluid, Locke's solution, human, horse, and dog serum, active and inactive, with varying results. The best results were obtained when the optimum temperature of 37° was held, and when to 10 c. c. *Piroplasma canis* blood 0.2 c. c. 50% dextrose solution are added. Sodium citrate was also tried. The culture is best in the first day of the appearance of the *Piroplasma* in the peripheral stream. Sixteen-day-old cultures kept at room temperatures showed themselves to be virulent for a dog. In the schizogony in cultures 16 and more merozoites were found in the red cells, which is not the case in cells from the peripheral blood of the dogs. Toxines produced by the parasites in the cultures were indicated by the presence of polychromatophilia in blood from normal dogs. L. C. Scott.

Emetine.—(Therapeutic Gazette, June, 1913, p. 418.) H. A. Hare reports that the keratin-coated product of emetine constitutes another advance, and has been introduced in order to enable the hydrochloride to be given orally. The keratin coating facilitates the contents of the product reaching the pathogenic areas of the bowel, unimpaired in activity and without interfering with gastric processes. Tablet emetine hydrochloride, gr. ½, keratin coated, is especially suitable for routine treatment in dispensary and out patient work, since it enables the patient to take the remedy himself. E. M. Dupaquier.

Emetine.—(Presse Medicale, June, 1913, p. 521.) M. Chauffard reports that emetine administered by rectum in dose of 10 centigr. in a litre of water according to Marchaix's idea, in a case treated by needle in Chauffard's service, the stools having been reduced to one or two a day, brought on the very same day a recrudescence of 15 typical dysenteric stools. E. M. D.

Researches on Pellagra.—(Gazetta degli ospedali, May & June, 1913, No. 59, No. 68, pp. 629-724.) M. Volpino reports that intramuscular injection of extract of spoiled maize produces in pellagrins a hypersensibility manifested by rise of temperature with malaise, stupor, psychic and nervous exaltation, acceleration of pulse and respiration, diarrhea. At times appear erythematous lesions, or a recrudescence of the pellagrous erythema already existing. The extract of sound maize gives rise to no accident of that kind. Volpino calls the active substance extracted by alcohol pellagrogenine. It exists also in sound maize, but its activity is neutralized by the presence of neutralizing substances. The reaction to pellagrogenine is observed in 90 per 100 of pellagrins and is found in 20 per 100 of healthy individuals. Sensibility to pellagrogenine cannot be transmitted to guinea pigs by

Digitized by Google

the classical processes for the study of anaphylaxis. Pellagrogenine is not toxic, or rather hardly so, in experimental animals. But it becomes toxic in animals submitted to a predominating or exclusive maize diet. These animals become sensitive also to injections of serum from pellagrins. E. M. D.

Echinococcus in the Spleen.—(Presse Médicale, Mercredi, June 25, 1913, p. 521.) M. Parlavecchio reports the following case: Patient admitted in a moribund condition, operated, at once, without local anesthesia. Cyst was covered with a sheet of splenic pulp. No splenoparietal adhesions. A circle of isolating sutures, followed by opening of cyst. Cure with no event. No post-operative hernia. Discussion of the most common surgical procedures follows, condemning simple puncture of cyst, praising total removal of cyst as the ideal method. E. M. D.

The Epidemiology of Sleeping Sickness.—(Archiv für Schiffs-und Tropenhygiene, Bd. 17, Hft. 10, 1913, p. 325 f.) F. K. Kleine and B. Eckhard report that the campaign against sleeping sickness on Lake Victoria (Africa) is bearing good fruit, which is due not only to the sanitary measures employed, but also to the peculiar character of the disease itself. They have usually found that sleeping sickness has a tendency to spread slowly. On Maisome Island, in Lake Victoria, an isolated focus of the disease was found. At the boat landing there were four persons suffering from the disease, who had presented symptoms for two or three years. The patients had never left the island, and they must have become infected there. Foreign infected boatmen had doubtless furnished the infecting material. Although the island literally swarms with *Glossina palpalis*, the disease did not spread, the remaining 500 inhabitants continuing healthy. Stolowsky also found small, circumscribed foci in South Tanganyika. English physicians have observed the same thing. For example, Kinghorn and Montgomery write: "It is very surprising to learn how slowly the disease spreads, even where *Glossina palpalis* abounds and favorable conditions exist for the spread of the disease. In several settlements on the Tanganyika, in which this fly, and also *Glossina morsitans*, were found in the vicinity of the native huts, we discovered only nine or ten cases of sleeping sickness, although in all probability the disease had been introduced four or five years before." Similar reports come from other parts of Africa. On the Gold Coast, Horn assumes an acquired immunity on the part of the natives in explaining the slowness of the march of the disease. When immunity occurs as a result of an epidemic, the number of healthy parasite carriers must be very great, such as we probably see in malaria, or, better still, in Texas fever, and in piroplasmosis of dogs. According to observations in Uganda and German East Africa, the majority of the infected individuals die in the course of a few

Digitized by Google

years. Nothing has ever been seen of a natural resistance, such as acquired immunity. Bouet and Roubaud are inclined to believe in immunity of the tsetse fly rather than man, according to their experiments on inoculation on the Niger. Anyone who has ever worked on the development of the trypanosomes, knows how difficult it sometimes is, in laboratory experiments, to make a *Glossina* infectious. In most of the *Glossinae*, the intaken trypanosomes do not develop any further, and it is recommended always to experiment with several hundred flies and various strains of trypanosomes. It is easy to conceive that *Glossinae* that have never before been in contact with trypanosomes, a large proportion of these parasites can, under favorable conditions, reach their full development. The irritation set up by the parasites in the body fluids, generates anti-bodies, which pass over into the larvae of the fly. The next generation of *Glossinae* is then less susceptible to infection with trypanosomes. That the anti-bodies that are found in mammals after trypanosome infection, are not sharply specific would appear not impossible, since *Glossinae* become immune to one kind of trypanosome after infection with another variety. Such hypotheses might explain the occurrence and disappearance of a plague, and could even explain how sleeping sickness suddenly ceases in a place infected for the first time. But we must determine experimentally whether or not any real basis exists for such a hypothesis. We did it in the following manner: A large number of female *Glossinae* were fed alternately on apes and she-goats that were infected with *Trypanosoma congolense*. The formation of anti-bodies in the bodies of the mother flies was thus stimulated. In about three weeks we began to collect the larvae, in order to subject the hatched-out flies to an inoculation test. In the course of 51 days, we fed 434 young *Glossinae* for 4 days on different apes infected with sleeping sickness, and then for 14 days on healthy animals. On the 18th day, the remaining flies (402) were killed and investigated. Eleven of them were found to be infected. In another batch of 90 flies, we waited for about a month (when *infected Glossinae* become *infectious*) and them fed them in three groups on three healthy apes. All three apes became infected; therefore, there must have been at least three infected flies among the ninety. There is no ground for the assumption that the daily intaking of trypanosomes produces anti-bodies in the flies that can be transmitted to the next generation. Immunity in men cannot explain the slow spread of sleeping sickness any more than immunity in *Glossinae*. The decisive point must be sought in the nature of the trypanosomes. It is impossible to inoculate *Glossinae* with some strains. Latterly, the climatic conditions of a locality have been invoked in order to explain an important influence on the development of the parasite in the body of the tsetse fly.

A. McShane.

Digitized by Google

Urolithiasis and Bilharziasis. — (Archiv für Schiffs-und Tropenhygiene, Heft. 9, 1913.) For several years, E. Pfister was engaged in histological investigations of Egyptian urinary concretions, for the purpose of definitely ascertaining their relation to *Bilharzia haematobia.* Among 68 specimens of Goebel, the egg of the *Bilharzia* (*Schistosomum*) could be positively found only 8 times. In Pfister's 30 cases, the egg was found with certainty only 3 times, and probably in 3 other cases. According to H. Schade, urinary calculi contain two kinds of constituents: colloids and crystalloids. It is clear that the mild inflammatory changes set up by the *Schistosomum* are capable of giving rise to colloids, e. g., urochrome, mucus, albumen, fibrin, fibrinogen, etc. Further, stagnation of the urine arises from displacement of the ureters and urethra by tumors, coagula, and strictures, and when bacterial infection, chiefly with *B. coli*, takes place, deposition of crystals can easily occur.

Excessive saturation of the urine with salts can arise from the vegetarian diet of the natives, whose blood becomes poor in water as a result of too much sweating, as well as from the rich mineral content of the water of the Nile.

The influence of river waters is still a disputed battlefield in the pathogenesis of urinary calculi, but it is a striking fact that certain rivers coincide with the distribution of calculus disease. An analysis of unfiltered Nile water by Muntz showed in summer 1.23 grams of mineral matter in two litres of water; and it is not inconceivable that this high proportion of minerals may contribute to the supersaturation of the urine with certain salts. (In European rivers the average amount of mineral matter is 0.026 to 0.03 grams per litre.) Taking into consideration the researches in urinary calculi, it is hardly possible to support the almost general opinion that those occurring in Egyptians are to be connected with Bilharziasis, i. e., contain eggs, worms, etc., in short, are foreign body stones. Possibly inflammation and bacterial infection, together with the high mineral content of the Nile water, are to be considered as factors. On account of the prevalence of bladder calculi in China, in the Canton Province, Scheube was guided to the discovery of the *Distomum Japonicum* as the cause. Researches on a collection of Chinese stones from regions not known to be infected by schistosomiasis were investigated. Other regions of China and India, where schistosomiasis occurs only sporadically and then in the intestines, but where urinary calculus is a widespread disease, allows the supposition that permeability of inflamed intestinal walls for certain crystalloid and colloid substances which, excreted by the urinary apparatus, form nuclei for calculi. The author found substantiations in his researches on Egyptian stones, in which he not infrequently found indigo crystals, rejecting the idea of indigo formation in the bladder. He thinks that a frequent control of the urine of the cases of schisto-

Digitized by Google

somiasis both in China and Egypt for indigo crystals and indican would do much to clear up the question of urolithiasis. L. C. Scott.

A Case of Apoplectic Malaria.—(New York Medical Journal, xcviii, 5, 1913, p. 243.) Bernard Kaufman describes a case of aestivo-autumnal malaria in a lad aged 14. The author found the boy in an unconscious state, with stertorous breathing and a temperature of 107° F. Quinine by needle (10 grains to 40 minims of water) was given; restoration to consciousness followed within the next 24 hours and the case went on to recovery. On account of sloughing at the site of the injection, the author recommends a much more dilute solution when the drug is administered by needle. Howard D. King.

Malaria and Suppurative Hepatitis.—(Malaria e Malat, d. Paesi Caldi, iv, 2, 1913, pp. 77-79.) In the above short paper, G. B. Fazzari reports two cases of malignant tertian malaria, both of which were accompanied by a suppurative hepatitis. From each 200 c. c. of pus were withdrawn. One died. According to the author, there was no evidence of either dysentery or hydatids. In accounting for the suppurative process in which marked structural changes occurred in the hepatic parenchyma, Fazzari states that the malaria rendered the organ more susceptible to invasion from such organisms as *B. coli* or "*Streptococcus duodenalis.*" These germs increase in virulency, and, owing to a lowered tissue resistance on part of the intestine and accessory organs, they cause infection of the bile channels or follow the course of the portal vein, and thus find their way to the liver. H. D. K.

Appendicitis from Helminths.—(Lyon Chirurgical, ix, 4, 1913, p. 460.) C. Garin and A. Chalier report a case of appendicitis due to helminths inoculating the intestinal walls with virulent organisms. They lay stress upon the pathogenic rôle that may be assumed by helminths, and urge examination of the stools in all cases of chronic abdominal disturbance. H. D. K.

Relapsing Fever Transmitted by Louse.—(Annales de l'Institut Pasteur, xxvii, 3, 1913.) According to C. Nicolle, L. Blaizot and E. Conseil, the bite of the louse will not transmit relapsing fever. Infected lice on several occasions were allowed to bite both man and monkey without untoward results; in one case 6515 louse bites proved harmless. There is an apparent disappearance of the spirilla from the organism of the louse after a certain interval, but this is illusory, as they again show themselves in the same louse, where they remain for about twelve days, when there occurs a permanent disappearance. The infection is transmissible to the young, and this hereditary factor probably maintains the virulency of the spirilla. Whilst in the louse the organisms do not enter the mouth or digestive tract, so all fear of com-

Digitized by Google

munication with the exterior is abolished. Death of the louse means the death of the organism. The portal of infection is usually through an abraded skin when a louse is crushed thereon. This is the mode of infection with relapsing fever in both man and monkey. H. D. K.

Beri-beri in British Soldiers.—(Jour. R. A. M. C., xx, 2, 1913, pp. 202-205.) In this concise paper, F. Smith and A. E. Hastings call attention to the prevalence of polyneuritis among the British soldiery stationed at Calcutta. As a result of their four years' observation, they note the fact that the disease is at its height in the autumnal months, when the weather is very hot, sultry and damp. Attention is called to a localized outbreak of polyneuritis in troops in a previously non-infected community as a result of the importation of a few convalescing beri-beritics. This epidemic could not in any wise be traced to food, as the dietary was ample and varied and well prepared. Sporadic beri-beri and epidemic dropsy are quite frequently met with in both Europeans and natives of Calcutta, but Smith and Hastings declare that neither rice nor alcohol can in any way be considered etiologic factors; this is especially so of those cases occurring in English troops in barracks. H. D. K.

Cholera in the Balkans.—(Berlin Klin. Woch., March 17, 1913.) In the above paper Rudolf Kraus describes the work he did to check the ravages of cholera among the Bulgarian troops. The disease was spread through drinking the river water into which the cholera corpses had been thrown. Stringent orders were issued that the army should use nothing but boiled water. The third army division alone had 30,000 suspected cases, with 3000 deaths. Nine field bacteriological laboratories were utilized for the examination of suspected cases. All troops were vaccinated. Suspects were sent to isolation hospitals. Tincture of iodine given two or three times a day was found effective both as a preventive of cholera and also in removing the vibrios in carriers' stools. H. D. K.

Protozoa-like Structures in the Blood of Blackwater Fever.—(Lancet, clxxxiv, 4679, May 3, 1913, p. 1230.) Alfred C. Coles discovered a small number of granular bodies in the latter stage of the disease. They were almost spherical and had a very thick outline; in some cases they seemed to be reinforced with a thick capsule. The author suggests that these small bodies may be some form of protozoal parasite, bearing a relation to Koch's blue bodies and the chlamydozoa of Prowazek.

H. D. K.

Amoebic Dysentery in Large Cities.—(Presse Medicale, 39, May 14, 1913, p. 389.) Lest cases of chronic amoebic dysentery, in cities, in temperate climates, go unrecognized, and, therefore, improperly treated, A. Chauffard calls attention to the presence of just such cases. He

Digitized by Google

gives his experience in a recent case of amoebic dysentery, in which there was a recurrence after eighteen years of apparent health. An ordinary attack of acute benign diarrhea served as fuel for latent amoebic infection. It was a long time before the condition was correctly diagnosed. Treatment by emetine cleared up all evidences of the disease. H. D. K.

Kala Azar Treated with Arsenic.—(Indian Med. Gaz., xlviii, 4, April, 1913, p. 131.) F. Roux reports the successful employment of arsenic in cases of kala azar. Ramalline, a special compound of arsenic, was used; it is well tolerated, and rather large doses may be given. The preparation is in pill form, each of which contains 1.25 mg. of arsenical salts; eight pills or a total of 1 cg. is the average daily dose. The author does not recommend this treatment for children.

H. D. K.

Suspected Organism of Erythema Multiforme.—(Deutsche Medizin. Woch., 17, April 24, 1913, p. 802.) Saisawa of Kitasato's laboratory, Tokio, is of the opinion that he has discovered the causal organism of this baffling malady. The author's case was that of a Japanese soldier, who presented a clinical picture of a mild erythema multiforme, but the symptoms soon became aggravated. The facial lesions were confluent and greatly swollen. New crops came out, attended with pus formation. Gastro-enteric symptoms were rather mild, but a few round worms were expelled. There was acute cardiac dilatation. A special bacillus was isolated from the blood and urine. Symptoms of acute nephritis were manifest. The organism isolated, in a measure, resembles that described by Sabrazes. Attempts at cultivation proved unsuccessful, but in other ways it behaves like the influenza bacillus. The author distinctly avoided calling the disease influenza, which is sometimes characterized by erythema multiforme. H. D. K.

Beri-beri in Nigeria.—(British Med. Journ., June 14, 1913, p. 1271.) E. G. Fenton, late Sanitary Medical Officer in Southern Nigeria, recalls, during a ten years' residence in that territory, his experiences with beri-beri. He cites the very interesting cases of four young Englishmen, who contracted beri-beri; one died, and the remaining three recovered immediately on leaving the district. Fenton states that these young men lived as well in Nigeria as they would have in England. Of the very best food there was an abundance and wide variety, very little rice figured in the dietary; hygienic conditions were ideal; the habits of the four were good, none of them were alcoholics, but, for some reason or other, they all fell victims to beri-beri. H. D. K.

Bronchocidiosis.—(Journal Trop. Med. and Hyg., xvi, 7, April 1, 1913, p. 102.) Aldo Castellani in the above paper deals with the various

Digitized by Google

types of bronchitis and bronchoalveolitis, due to fungi, occurring in tropical regions. The symptoms are, more or less, similar and not dependent upon any one type of fungus. The mild cases are distinguished by slight bronchitis with a mucopurulent expectoration in which the fungi are found. Cases of a severe type closely resemble phthisis. The disease is transmissible from man to man, and also probably by the saprophytic existence of the fungi in nature. The examination of the sputum furnishes the clue to correct diagnosis. For the identification of the fungi cultivation is necessary. All the species of *Monilia* grew to a certain extent on gelatin. The treatment that gives the best results is potassium iodide in doses of 10 to 20 grains three times a day. Tonics are indicated and the patient should be amply nourished. H. D. K.

Malta Fever in Arizona.—(Arizona Medical Journal, i, 4, 1913, p. 47.) C. E. Yount and R. N. Looney, of Prescott, report five cases of Malta fever occurring in Arizona within the last eighteen months. It is the belief of the authors that the Arizona goats will furnish a rich field of research into Malta fever. Positive agglutinations with *Micrococcus melitensis* was obtained in all of the authors' cases. All their patients were, in some way or another, intimately associated with the goat-raising industry. H. D. K.

Apyrexial Malaria.—(Journal Royal Army Medical Corps, xx, 2, 1913, p. 102.) R. H. Firth calls attention to the apyrexial state and the means by which the condition can be detected. As to the means of detection, the author declares that the total leucocyte count for leucopenia or leucocytosis, coupled with a differential leucocyte count, is most valuable. By using Plehn's test, which utilizes the greater or less presence of urobilin in the urine, corroborative evidence as to the destruction of the blood may be obtained. Once the condition is detected, the suspected individual must be looked upon as a menace and treatment instituted accordingly. H. D. K.

Cholera and Drinking Water in the Balkans.—(Neues Wiener Tageblatt, January 5, 1913.) Dr. Bruno Busson, an attache of Prof. Rudolf Kraus's bacteriological mission to the Bulgarian army, in the above publication recounts his experiences at Tschorlu. On account of dysentery, cholera, and typhoid being rife among the Bulgarian troops, the king is stated to have issued an order directing every Bulgarian soldier to take an oath not to drink any unboiled water. As a result the daily incidence of the disease fell from 20,000 to 2,000. All infectious diseases were treated in separate hospitals. The torch was freely applied to all litters of dirt, dung and other fly-breeding places. Despite the prevalence of smallpox among the children of the town, not a single case occurred among the troops, owing to their thorough vaccination. H. D. K.

Digitized by Google

simple measures. The anatomy and use of the foot is written in a simple vein and well adapted for lay use. There are also many useful hints as to the sock and method of wearing it. The cause and effect of flat foot are dealt with rather fully and illustrated with some admirable diagrams. This book should be in the hands of every military medical officer. It is the opinion of the reviewer that the book should prove useful to those whose occupation entails a great deal of walking, as postmen, track walkers, police officers, and collectors. H. D. K.

Reports from the Laboratory of the Royal College of Physicians, Edinburgh. Edited by George Lovell Gulland, M. D., and James Ritchie, M. D. Vol. xii. Edinburgh: Oliver & Boyd. 1913.

This attractively bound volume contains 26 reprints from various journals, of contributions by various members of the laboratory staff of the College.

Among the communications of interest to students of tropical or preventive medicine are the following: Soaps and their Effects on the Skin, by Frederick Gardiner, M. D.; Vaccine Therapy, by James Ritchie, M. D.; On an Epidemic of Conjunctivitis Associated with the Presence of a Gram-positive Diplococcus, by J. P. M'Gowan, M. D.; Some Observations on a Laboratory Epidemic, principally among Dogs and Cats, by J. P. McGowan, M. D.; Remarks on a Case of Sporatrichosis, by Norman Walker, M. D., and James Ritchie, M. D.; The Relative Prevalence of Human and Bovine Types of Tubercle Bacilli, by John Fraser, M. D., and A Possible Test in the Differentiation between Human and Bovine Types of the Tubercle Bacillus, by John Fraser, M. D.

The year's work from this laboratory makes a highly creditable showing. Creighton Wellman.

REPRINTS.

Brayton, Alembert Winthrop. Salvarsan Arrests Tabes and Paresis. Reprinted from Indianapolis Medical Journal, February, 1913.

Brayton, Alembert Winthrop. Some Uses of Sulphur Powder in Diseases of the Skin. Reprinted from Indianapolis Medical Journal, February, 1913.

Cazenavette, L. L. Intramuscular Injection of Mercury (emulsion) in the Treatment of Syphilis of the Nervous System. Reprinted from the New Orleans Medical and Surgical Journal, May, 1913, vol. lxv.

Craig, Charles F. Identity of *Entamoeba histolytica* and *Entamoeba tetragena*. Reprinted from the Journal of the American Medical Association, May 3, 1913, vol. lx, pp. 1353-1354.

Digitized by Google

Craig now considers that these two species are identical, and has been able to observe every form of both in recent material representing a single species, which, by virtue of the law of priority, must be known as *E. histolytica*. C. W.

Craig, Charles F. Identity of *Entamoeba histolytica* and *Entamoeba tetragena*, with Observations upon the Morphology and Life Cycle of *Entamoeba histolytica*. Reprinted from the Journal of Infectious Diseases, vol. xiii, No. 1, July, 1913.

The author gives *in extenso* his reasons for considering *E. histolytica* and *E. tetragena* as one species. The paper is detailed and careful, with two plates from photomicrographs. The evidence brought forward by Craig and his authority as a cautious and balanced observer give his opinion great weight. The name *tetragena* now falls as a synonym of *histolytica*. C. W.

Craig, Charles F. Interpretation of the Results of the Wasserman Test. Reprinted from the Journal of the American Medical Association, February 22, 1913, vol. lx, pp. 565-569.

Craig, Charles F., and Nicholls, Henry J. Study of Complement Fixation in Syphilis with Spirochaeta Culture Antigens. Reprinted from the Journal of Experimental Medicine, vol. xvi, No. 3, 1912.

Eccles, R. G. Medical Anthropology. Reprinted from the Reference Handbook of the Medical Sciences. 3 ed. Wood. New York.

Eccles, R. G. Scope of Disease. Reprinted from the Medical Record, March 8, 1913.

Lyons, Randolph. Treatment of Amebic Dysentery with Subcutaneous Injections of Emetine Hydrochlorid. Reprinted from the Journal of the Americal Medical Association, April 19, 1913, vol. lx, pp. 1216-1220.

The author reports six cases, of whom five recovered under this treatment. The advantages of the treatment, according to Lyons, are simplicity and ease of administration, absence of vomiting and depression, accurate dosage, rapid absorption and effect, and reliability of the product. Lyons believes that his results are highly suggestive that in this method an ideal treatment for amebic disease has been found. C. W.

Maes, Urban. Fracture of the Acetabulum. Report of a case. Reprinted from New Orleans Medical and Surgical Journal, May, 1913, vol. lxv.

Maes, Urban. Surgical Aspects of Goitre. Reprinted from New Orleans Medical and Surgical Journal, July, 1913, vol. lxvi.

Martin, E. H. Salvarsan in the Treatment of Syphilis and Pellagra. Reprinted from Memphis Medical Monthly, January, 1913.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CREIGHTON WELLMAN, M. D. ..... EDITOR-IN-CHIEF
CHARLES CHASSAIGNAC, M. D.
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine
JOHN M. SWAN. M. D., Secretary, American Society of Tropical Medicine } *Ex officio*
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M, D., University of Pennsylvania.
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. SEPTEMBER, 1913 NO. 3.

EDITORIAL

A Congress on Tropical Medicine.—The American Medical Association, at the Minneapolis meeting, empowered the Board of Trustees to further the committee appointed to consider a mode of celebrating the opening of the Panama Canal. The committee in question reported, in 1912, recommending a Congress on Tropical Medicine to be held in 1915, at the time of the meeting of the American Medical Association.

The American Society of Tropical Medicine, at the New Orleans meeting, proposed the same sort of gathering, and in May of the current year, appointed a committee to coöperate with the American Medical Association in carrying out the plans for a Congress.

No more opportune occasion could offer for a gathering interested in tropical diseases than the time of opening the Panama Canal, for the achievements in sanitation in a tropical country, opening the way to the feats of engineering which

Digitized by Google

followed, have indeed set a climax for the series of discoveries in tropical medicine.

No more suitable place could be selected than the United States, whose sons have made the Canal possible.

More than this, the interest in tropical diseases has now reached a point of such magnitude that a more general knowledge of the subject has become necessary, and though, as yet, the fields of endeavor have lain in countries more or less distant, the entire medical profession in all countries is concerned in the further investigation of exotic diseases.

The congresses for tropical diseases in the Far East have shown how much may be brought together at such meetings, and if a more widespread effort at collecting material was exercised, a congress of international scope would make for an epochal event.

As planned by the committee of the Americal Medical Association, the Congress would coördinate all bodies and individuals everywhere, interested in tropical diseases, and governments would be solicited to make a great occasion of the gathering of scientific men engaged in the study of this, as yet, virgin field.

The United States has a particular interest in the subject, for no other country is so proximate to its tropical tributaries as the United States. The closer relations with the countries to the South will need a better knowledge of the diseases of these countries, and more than this, all of the States in the seaboard are liable to the importation of new diseases at all times.

The new era of medicine, preventive medicine particularly, demands advance knowledge of disease, and with the newer subjects for study, concomitant methods must develop. So that, as the plans for a Congress mature, all men interested in the subject should coöperate to make a success of the meeting.

Isadore Dyer.

Digitized by Google

The Public Interest in Hygiene.—It is easy to recall the time when, a few years ago, a semi-popular work on sex questions was suppressed in England and the publisher arrested. The author himself, Havelock Ellis, might also have gone to jail if he had not been abroad.

Now the very depths of sex problems are ventilated in the press and on the stage and the economic and sociologic phases are discussed in the fullest detail.

Since the Congress at Brussels in 1899 many similar conventions have met and debated the various conditions related to prostitution and its satelites, venereal diseases, until the public has not only become aware of such things, but it has actually become interested.

Several of the larger cities in the United States have systematically undertaken the investigation of vice incidence and the results already have occasioned material action in the way of amelioration of civic conditions. Volunteer organizations have arisen to protect young women and the coöperation of Federal and State authorities has provoked active legislation which has become sufficiently operative to have made traffic in women a dangerous procedure amenable to swift justice.

The complexion of public opinion has changed, too, so far as prostitution is concerned. Formerly this was either overlooked, tolerated, or licensed in this country; now the tendency everywhere is to make the trade so condemned as to compel public disapproval of its existence. At this time there is more turmoil than anything else, but this is only the natural condition which must lead to future action for the public good.

This is only one phase of a large question now actively before the public. Associated are the State relations to the study of its public charges in institutions, asylums and schools. Defective children are the signals of a morbid citizenship, from the hygienic point of view, and as the study advances, more

Digitized by Google

and more reason appears for the better education of the public in relation to hereditary influences.

Eugenic questions are no longer of mere academic discussion, but these have become problems of state importance. Marriage laws have been engrafted with restrictions compelling, in some States, certificates of health as a formality before the marriage contract can be completed. Even the churches have, here and there, made regulations in this regard.

There is no general consensus of action for the promulgation of such procedures, but the need is evident from the unrest prevalent everywhere.

The field of medical practice and medical thought is engaged in the active solution of the occasion which has led to the public interest in all these questions. The protection of the young by proper instruction; the safeguarding of the innocent by the modern therapeutic methods; and the improvement in the care of the afflicted by better clinic provisions, are all active and live questions of present concern.

The public is awake, at last, to the need of properly qualified public health officials and in the variety of matters which affect the public health there are so many which concern the individual citizen that he must needs take notice.

We have touched only on the more active questions of today, but the medical profession has a large task ahead and one which will keep all busy—in the public weal.

Isadore Dyer.

Digitized by Google

ORIGINAL ARTICLES

FREE-LIVING AND PARASITIC AMOEBAE AND THEIR RELATION TO DYSENTERY.*

By EUGENE R. WHITMORE,
Major, Medical Corps, U. S. Army, New York City.
(With Plate I.)

The first account of the presence of amoebae in the intestinal contents of man was given by Lambl (1859), but he attached no importance to their presence.

Amoebae were first considered to be a cause of dysentery by Lösch (1875), who called the amoeba which he found, *Amoeba Coli*. Other observers, especially Kartulis (1885-1891), confirmed Lösch's finding, and some experimental infections were obtained in animals; but the etiologic relationship remained obscure, as there were numerous findings of amoebae in the intestinal contents of persons who had no dysentery and who had never had dysentery; and there were epidemics of dysentery in which amoebae were not found in the stools.

As a result, there developed an opposing belief that amoebae did not cause dysentery, but that they were accidentally present in the intestinal contents, and had invaded the ulcers secondarily.

There was a well-established belief that there were two different forms of dysentery, and Councilman and Lafleur (1891) made an exhaustive study of amoebic dysentery, which they distinguished from the diphtheritic form of the disease. They considered the *Amoeba dysenteriae* to be the cause of amoebic dysentery, and suggested that there were several species of amoebae, which under certain conditions and in certain localities may inhabit the colon.

The discovery of the dysentery bacillus by Shiga (1898), and the confirmation of this work by Flexner (1900) and others,

*Read and published with permission of the Surgeon General, U. S. Army, at the Tenth Annual Meeting of the American Society of Tropical Medicine held at Washington, May 6, 7, and 8, 1913.

Digitized by Google

cleared up the etiology of the diphtheritic or croupous form of dysentery, in which amoebae were not found.

Schaudinn (1903), studying the morphology and life cycle of the intestinal amoebae of man, showed clearly that there were two distinct species of amoebae parasitic in the intestine of man; one a common and harmless commensal, the other being found only in ulcerative dysentery. The morphology and life cycle of the harmless form has been well described by Casagrandi and Barbagallo (1897). Schaudinn called this species *Entamoeba coli.* Jürgens (1902) had given a fair description of the pathogenic species, which Schaudinn called *Entamoeba histolytica.*

Craig confirmed Schaudinn's work in 1905, and later it was confirmed by Werner, Hartmann, and others; and it seemed for a time that this work of Schaudinn's had cleared up the question of the relation of intestinal amoebae to dysentery.

But, very soon, the confusion became greater, almost, than it had been before. Schaudinn died before he completed his work, and when he had published only his preliminary report with no drawings. Schaudinn was aware that there was something more to the question of intestinal amoebae than he had been able to give in his preliminary report.

As is evident from Huber's (1909) work, Schaudinn was familiar with a four-nucleated cyst and he used the term "tetragena" for this cyst, but he was not able to distinguish the vegetative forms from *Ent. coli.*

Viereck (1907) showed that these four-nucleated cysts were characteristic for a pathogenic amoeba which he called *Ent. tetragena;* but he was not able to differentiate the vegetative forms from *Ent. coli.*

At the same time, Hartmann (1907) found an intestinal amoeba in dsyentery cases from South Africa, and from the finer structure of the nucleus, he was able to differentiate this amoeba from *Ent. coli* and *Ent. histolytica;* he considered it a new species and called it *Ent. africana.*

Later (1908), Hartmann found the cysts of this new amoeba, and by comparing his material with Viereck's, he found that his

Digitized by Google

Ent. africana was identical with Viereck's *Ent. tetragena,* so *africana* fell as a species name.

Very soon, *Ent. tetragena* was reported in dysentery cases from all parts of the world, and it was evident that Schaudinn's *Ent. histolytica* was a rare cause of dysentery.

Hartmann (1909), in speaking of his delay in publishing, says: "Besides, I have often doubted, during my investigations, whether *E. histolytica* is a true species, after all, or only represents degeneration forms of *E. tetragena.*" But his doubts were set aside by "the great regularity of the forms in the preparations, especially that of the chromidia formation."

Walker (1911) says: "One presumably pathogenic species of the genus *Entamoeba, Entamoeba histolytica* Schaudinn, which includes *Entamoeba tetragena* Viereck, and which develops cysts containing four nuclei, is recognized."

Hartmann worked over Schaudinn's material and was able to show, in every case except one, that what Schaudinn had considered to be *Ent. histolytica* was in reality *Ent. tetragena.* Hartmann also showed that the case which Jürgens (1907) studied in his second work, was *Ent. tetragena.* In the same way, further study of material, from other sources, which had been held to be *Ent. histolytica,* showed such material to be *Ent. tetragena.*

Craig (1913) continued the study of his material and compared it with new material, and he came to the conclusion that that portion of the life cycle of *Entamoeba histolytica* that Schaudinn and he, as well as others, had interpreted as spore-formation was wrongly interpreted, and that such forms are really degenerative in nature. He found that the normal method of reproduction of *Entamoeba histolytica,* in the cystic stage, is by the formation of cysts containing four nuclei, and concludes that *Entamoeba histolytica* and *Entamoeba tetragena* are identical.

Darling (1913) concludes that the spore cyst forms of *E. histolytica* were described from degenerating races of *E. tetragena.*

Councilman and Lafleur (1891) suggested the name *Amoeba dysenteriae* for the organism which was described by Lösch as

Digitized by Google

Amoeba coli, and they say, "The name given to it by Lösch is not distinctive; for it seems very probable that there may be a number of species of amoebae, which under certain conditions and in certain localities may inhabit the colon."

Strong and Musgrave (1900) and Strong (1901) divide the intestinal amoebae of man into two species: *Amoeba dysenteriae,* which causes dysentery, and *Amoeba coli,* which is non-pathogenic.

Craig (1905), in an extensive discussion of the subject, says "The name *Entamoeba histolytica,* however, should be changed to *Entamoeba dysenteriae,* as Councilman and Lafleur accurately described the amoeba which produces dysentery before the publication of Schaudinn's article." "The pathogenic form should be known as *Entamoeba dysenteriae* (Councilman and Lafleur), while the nonpathogenic should be known as *Entamoeba coli* (Lösch)."

Brumpt (1910) uses the name "*Amoeba dysenteriae* Councilman and Lafleur, 1893," and gives as a synonym, "*Entamoeba histolytica* Schaudinn, 1903."

Doflein (1911), after referring to Hartmann's work on the identity of *histolytica* and *tetragena,* says, "If the recent investigations by Hartmann are fully confirmed, this will have the following influence on the naming of the dysentery amoeba: the name *E. histolytica* has priority over the name *E. tetragena* V. Since the confirmatory characteristics of the dysentery amoeba are common to *histolytica* and *tetragena,* the two forms described as different species are identical, and the name *tetragena* would be allowed to fall and the name *histolytica* alone used for it. But it is perhaps most to be recommended to apply the rule of priority strictly and to take up again the name *Entamoeba dysenteriae* (Councilman and Lafleur, 1893)."

Hartmann (1913) says, "Here the dysentery amoebae are handled as two separate species. This is done only on the basis of the preparations of one of Schaudinn's cases, and on his infection experiment. If in this case the identity with *E. tetragena* can be established, which I consider very probable, then the name *E. tetragena,* according to the rules of nomenclature, will be eliminated. In this case, following Doflein's (1911) sugges-

Digitized by Google

tion, I propose the old name *Entamoeba dysenteriae* Councilman and Lafleur, 1893, although these authors gave no recognizable morphological characteristic of the amoeba. Then one might speak of the Tetragena-Form as the typical form, and of the Histolytica-Form as the degenerative form."

Stiles (1905) held that *dysenteriae* was not a new species name, but that it was a synonym of *coli*, as Councilman and Lafleur had not differentiated the pathogenic from the non-pathogenic intestinal amoeba of man, and that *histolytica* Schaudinn was the proper species name. Craig (1908) accepted Stiles' conclusion.

Walker (1911), Wenyon (1912), Craig (1913), and others hold that the name *tetragena* should be dropped and the name *histolytica* be retained as the species name of the dysentery amoeba.

It seems to be agreed that the name *tetragena* should be dropped, but there is a difference of opinion as to whether *histolytica* is to be retained as the species name, or *dysenteriae* is to be taken up again as the species name. I do not propose to enter into the discussion of what is to be the species name; but purely for clearness in this paper, I will use the term *Ent. tetragena* for the life-cycle as described under that name by Viereck and Hartmann and others, and the term *Ent. histolytica* for the life-cycle as described under that name by Schaudinn and others.

While degenerating forms of the dysentery amoeba have given so much trouble in determining which is the normal of two life-cycles, they have also been described as another species, *Ent. nipponica*, which Hartmann and Whitmore have shown to be degenerating forms and not a new species.

Elmassian (1909) described a new species of entamoeba, *Ent. minuta*, from a case of dysentery from South America. The case was one of mixed infection with *Ent. coli*. From his description and his plates it appears that vegetative *Ent. minuta* is described from the pre-encystment stage of *Ent. tetragena*, or from vegetative forms of *Ent. coli*, or from both. The four-nucleated cysts are certainly *Ent. tetragena*. I have recently had an opportunity to examine some material, from Panama,

Digitized by Google

that was sent to me as *Ent. minuta,* and I can unhesitatingly say that this material is *Ent. tetragena.*

Since studying this material, I have changed my opinion from that expressed by Hartmann and Whitmore (1912) that "*Ent. minuta* is identical with *Ent. coli.*" I believe that *Ent. minuta* was described mainly from the encystment stage of *Ent. tetragena* and probably also from *Ent. coli.*

So, to-day, we are concerned with two intestinal amoebae in man: one, *Ent. coli,* a harmless commensal, found in the intestine of healthy man, and one, *Ent. tetragena,* a pathogenic organism, causing ulcerative dysentery.

It is not the purpose of this paper to go into the morphology of these two species of entamoeba, but I desire to lay stress on a few important points, as it will enable us better to understand some problems that are to be discussed later.

The Nucleus of the Vegetative Forms.

Hartmann was the first to distinguish between the vegetative forms of *Ent. coli* and what might be called the normal vegetative forms of *Ent. tetragena,* and the one great point that was of service to him was the finer structure of the nucleus. At the same time, Viereck determined that *Ent. tetragena* was distinct from *Ent. coli* by the type of cyst which it formed. Certainly we must have here, in the structure of the nucleus and in the cyst, two very important points in regard to these two species of entamoeba.

The general type of the nucleus is the same in *Ent. coli* and *Ent. tetragena.* The nucleus is quite rich in chromatin, and when stained, shows a central caryosome and a peripheral layer of chromatin arranged along the inside of a distinct nuclear membrane. The space between this central caryosome and the peripheral layer of chromatin, is occupied by a distinct network of achromatin, with granules of chromatin at many of the nodes of this network: that is, it is a vesicular nucleus with a relatively small caryosome, and a strongly developed outer-nucleus.

So far, the nucleus is the same in both species. But when we come to the finer structure of the nucleus we find the difference on which Hartmann differentiated the two species.

Digitized by Google

In the protozoal nucleus there is very commonly a cyclic change in the caryosome, which seems to be associated with the physiology of the cell. This cyclic change consists in the passage of chromatin from the caryosome to the periphery of the nucleus, and a new formation of chromatin in the caryosome, or the return of the chromatin from the periphery of the nucleus to the caryosome.

Hartmann found this cyclic change strongly marked in the nucleus of *Ent. tetragena* (Fig. 5). The caryosome is generally small and is surrounded by a clear zone, and between this zone and the periphery of the nucleus is the achromatic network with granules of chromatin scattered through it. At its outer border, this clear zone is often marked off from the achromatic network, almost as sharply as though it was surrounded by a membrane, by the line of chromatin granules at the nodes of the network. This clear one around the caryosome results from the chromatin passing out from the periphery of the caryosome to the periphery of the nucleus. A central granule, the centriole, can generally be seen in the center of the caryosome.

The nucleus of *Ent. coli* does not show such marked development of this cyclic change (Fig. 9). Here, is a relatively small caryosome, and between this and the periphery of the nucleus is an achromatic network with granules of chromatin scattered through at the nodes, and with only a slight clear space around the caryosome. There is not the broad, clear space around the caryosome with its sharply marked outer border, as in the *tetragena* nucleus. It is to be remembered that the cyclic change is present in the *coli* nucleus, since it is very commonly present in the protozoal nucleus, and we do find *coli* individuals which show this clearly-marked zone around the caryosome, as was pointed out by Hartmann (1912). But this appearance is the rule in the *tetragena* nucleus, and it is the exception in the *coli* nucleus. Naturally, one does not, from a single vegetative entamoeba, say whether it is *tetragena* or *coli*, but when one studies a number of amoebae in a specimen, the distinction comes out clearly.

Another point, noted by Hartmann and Whitmore (1912), is that, in the *coli* nucleus, the caryosome is often (20-30%)

Digitized by Google

spindle-shaped with the centriole divided (Fig. 10), as is so frequently the case with the centriole in the metazoal cell, while this is an extremely rare condition of the caryosome in *tetragena.*

Walker, James, Craig, and others, consider that the *histolytica* type of nucleus is more common than is the *tetragena* type in active dysentery. Schaudinn described the *histolytica* type of nucleus for the vegetative form of *E. histolytica,* and we now know that his description was from vegetative forms of *E. tetragena.* The *histolytica* type of nucleus is very poor in chromatin; there is generally only a very small caryosome, and a fine layer of chromatin around the periphery of the nucleus. Very rarely, one sees a centriole in the caryosome. There is not the distinct nuclear membrane of achromatin as seen in the *coli* and *tetragena* types of nucleus. The nucleus is commonly placed eccentrically and is readily distorted by foreign bodies in the cytoplasm.

I have had an opportunity to study preparations from four cases in which the amoebae were considered to be the *histolytica* type, and in every case, either in the original preparations, or by restaining, I have been able to bring out the *tetragena* type of nucleus in a good proportion of the amoebae.

I have seen shrinking of the nucleus and very faint staining of the chromatin, even in *E. coli,* when the specimen was not promptly and properly fixed, or, from maceration, when the smear was left for several days in the iron-alum solution before staining. Hartmann states that many errors have resulted from improper fixation.

But it seems certain that the *histolytica* type of nucleus is commonly met with in the large vegetative amoebae in active dysentery; and this is to be expected. The nuclear membrane is not a permanent structure, but its presence or absence depends mainly on the amount of achromatin contained in the nucleus. The cyclic change, described for the *tetragena* type of nucleus, very often leaves the caryosome as little more than a central dot; and the amount of chromatin in a nucleus varies under conditions of age and vegetative function. Wenyon (1912) says, "It is admitted that the pathogenic and non-pathogenic amoeba of man are subject to much variation, so

Digitized by Google

that differences at one time marked are hardly to be recognized at others.

Then, even in acute dysentery, undoubtedly many of the amoebae are degenerating, and this would add to the number of *histolytica* forms. Wenyon, speaking of the production of dysentery in cats, says, "and just as in cases of amoebic dysentery in man, many of the amoebae are degenerating and show abnormalities in nuclear structure, so in the cat one encounters many altered forms; as Hartmann has shown, in the cat the number of altered abnormal amoebae is greater than in man."

On making a restudy of a large number of preparations, with the special object of finding the *histolytica* type of nucleus, I have been very strongly impressed with the comparative rarity with which I find a large vegetative amoeba without distinct indication of the cyclic change which Hartmann described as so characteristic for the *tetragena* type of nucleus.

One rarely sees nuclear division in the large vegetative amoebae; but before encystment, nuclear division is very frequently seen. The nucleus is markedly elonged and shows a definite spindle, on which the chromatin granules are arranged longitudinally in a groundwork of plastin. One often sees the centrioles at the poles, and the remains of a centrodesmosis between them (Fig. 7).

Chromidia Formation and Encystment.

It is recognized that chromatin exists, in the protozoal nucleus, in two forms: generative chromatin, which continues on to the next generation, and vegetative chromatin, which is concerned with the vegetative functions of the individual in which it exists. The vegetative chromatin is thrown out from the nucleus into the cytoplasm under various conditions, but especially when the protozoon ceases its vegetative functions and encysts.

Chromatin thrown out into the cytoplasm under these conditions is known as chromidia, and these chromidia have no further use in the cell, but are to be extruded or absorbed.

When a protozoal cell is degenerating or dying, chromatin is

Digitized by Google

thrown out from the nucleus into the cytoplasm in the form of chromidia, which are to be thrown off from the cell.

Another form of chromidia results from the generative chromatin passing into the cytoplasm, but instead of being thrown off or absorbed, these chromidia form new nuclei. According to Hartmann's (1911) theory of the structure of the protozoal nucleus, each one of these ideo-chromidia must contain a centriole in order that it may become a nucleus.

When encystment begins in *Ent. coli* and *Ent. tetragena*, the food masses are thrown out, and the cytoplasm becomes more dense. The vegetative chromatin passes out from the nucleus into the cytoplasm, in the form of chromidia, which are to be thrown off or absorbed.

At this time the nucleus of *tetragena* loses its characteristic appearance. The nuclear membrane becomes indistinct, the nucleus is not nearly so rich in chromatin, there is no evidence of the cyclic changes, and the nucleus is readily distorted in shape; that is, the nucleus assumes the appearance as described by Schaudinn for *histolytica*.

One of my Manila cases showed the *histolytica* type of nucleus, and was determined to be *tetragena* only after prolonged study enabled me to find a few cysts.

Before encystment, and before the chromidia are thrown off, the nucleus of *tetragena* may resemble the *coli* nucleus, as has been noted by Walker.

As encystment proceeds, the chromidia enlarge, and are generally thrown out in the case of *Ent. coli*, while in the case of *Ent. tetragena* they frequently remain as the large sausage-shaped chromidia that are so characteristic of the complete *tetragena* cyst.

In both species, the nucleus divides repeatedly until the *coli* cyst contains eight nuclei (Fig. 11), the *tetragena* cyst four nuclei (Fig. 8).

Some observers have held that the chromidia, which are met with in the encystment stage of these amoebae, are of a different structure than the chromatin of the nucleus, and apparently they base their opinion on different staining reactions with some of the stains which they have used. Minchin (1912) ex-

Digitized by Google

presses the general opinion as to the nature of chromidia, when, after suggesting "the term *chromidiosome* to denote the smallest chromatin particles of which the chromidial mass is made up," he says, "It is clear, however, that the chromidiosomes of which the chromidial mass scattered in the cytoplasm is built up are in no way different in kind from the minutest granules of chromatin contained in the nucleus." Hartmann says, "They are true chromidia in the sense as used by Richard Hertwig, as is shown by their staining and microchemical reactions." They "have their origin in the nucleus," but "increase enormously in size and number in the cytoplasm." As long as that opinion is held, a difference in staining between the chromidia and the chromatin in the nucleus will speak rather for some fallacy in the staining method used, unless carefully controlled by a number of staining reactions.

While the normal individuals among the amoebae proceed to encystment, a great many individuals degenerate and die; and in the case of *tetragena,* far more than half of the individuals die. In these dying amoebae, the nucleus breaks up, and the chromatin passes out into the cytoplasm in the form of chromidia which are frequently thrown off with masses of the cytoplasm which is breaking up.

This gives the appearance of cyst formation as described for *histolytica,* and, when we remember that regularly over half the amoebae die this way; that in cats, more and more of the amoebae die this way, until at the fourth to sixth passage ordinarily all amoebae have died; it is possible that one might meet with dying strains in cases of dysentery where it would be impossible to find any amoebae that were going on to encystment in the normal way.

It is these dying forms that have led to the confusion in the description of the cyst formation for *histolytica.*

Ent. coli, living normally in the intestinal contents, does not so frequently find itself in abnormal surroundings, so it is quite true to type; but *tetragena,* being a tissue parasite, frequently finds itself in abnormal surroundings and under adverse conditions, and it is probable that this accounts for some of the variations that are noted in its nucleus.

Digitized by Google

Hartmann (1912) pointed out that the cat's intestine is not the normal medium for *Ent. tetragena,* and that here the nucleus is generally of the *histolytica* type. Darling (1913) has recently called attention to the same point.

Mention has already been made of the degenerating forms which have furnished the description of *Ent. nipponica,* and the encystment stage which has furnished at least a part of the material for the description of *Ent. minuta.*

Pathogenicity.

Calandruccio (1889-90) was able to "infect" men by feeding them the cysts of *Ent. coli* and no evidences of disease were produced.

Casagrandi and Barbagallo fed the cysts of *Ent. coli* to cats and were able to "infect" the cats without producing disease in them. Schaudinn "infected" himself twice by taking the eight-nucleated cysts of *Ent. coli* by mouth, but there were no symptoms of disease following these "infections." Since Schaudinn showed clearly that there were two species of intestinal amoebae in man, the "infection" of animals and man with *Ent. coli* has been repeatedly accomplished, without, in any case, there being any disease produced.

On the other hand, Schaudinn, Craig, and a number of other observers have produced severe dysentery in from 50-65% of kittens when fed with, or given rectal injections of, material containing *Ent. tetragena.* Of course, only cyst-containing material produces dysentery when given by mouth.

So we know that there are two intestinal amoebae in man; one being a harmless commensal, the other producing ulcerative dysentery; further, that these two species of entamoebae are characterized especially by the morphology of the nucleus in the vegetative forms, and by their cysts.

Soon after Schaudinn published his preliminary report on the intestinal amoebae of man, a number of observers took up, with renewed vigor, the question of the cultivation of amoebae, and attempted to apply it anew to the study of the intestinal amoebae of man. It was known that some of the free-living

Digitized by Google

amoebae would grow on various media when bacteria were present to serve as food (not a symbiosis).

Musgrave and Clegg, Lesage, Walker, Noc, and others, obtained cultures of amoebae from various sources, including the stools of healthy men, the stools of cases of amoebic dysentery, pus from liver abscesses; and these observers considered that the amoebae which they obtained in their cultures were the same as the amoebae which they found in the stools and in the pus from liver abscesses.

Hartmann, Werner, Craig, Nägler, Whitmore, and others, opposed this belief, and stated that the amoebae which these workers had obtained in their cultures were free-living amoebae of the *limax* type which had been taken in (as cysts) with food, and, generally as cysts, passing through the intestine, developed in the cultures; or that the cysts got in as contamination during the handling of the material, or in making the cultures. Later (1911), Walker came to the same conclusion.

Chatton (1912) made a new genus, *vahlkampfia,* for these so-called *limax* amoebae.

Minchin (1912) states that "in cultures made from human feces, free-living, non-parasitic species of amoebae make their appearance, which have passed through the digestive tract in an encysted condition, and emerge from their cysts in culture," and in a foot note he says, "whether this also applies to cultures made from pus of liver abscesses, as asserted by Whitmore and Hartmann, may well be doubted; it is not easy to understand how an encysted amoeba could be transported passively from the intestine into a liver abscess."

My statement (1911), to which Minchin refers, is "In the case of the culture from the pus of a liver abscess, the only explanation I can offer is, that the amoeba got into the material as a contamination during the handling of the material."

This statement was not intended to be, and does not read like, a suggestion that an encysted amoeba was transported passively from the intestine into a liver abscess.

Prof. Hartmann's statement on the subject is, that the cysts were accidentally in the abscess pus. As Prof. Hartmann's statement follows my work with him, I know that he has no idea

Digitized by Google

that an encysted amoeba is transported passively from the intestine into a liver abscess.

All who have done much culture work in the Tropics know the great frequency of contamination of cultures, especially when the cultures are carried on Petri dishes. With free-living amoebae everywhere, it is not at all surprising that we get them quite frequently as contaminations when using a medium suited to their growth.

Wells (1911) comes to the following conclusions: "Amoebae of at least two different types are, in this part of India at any rate, commonly present in the air, just as are many moulds and bacteria.

"These amoebae can readily gain access, (I) to specimens of feces, however carefully collected, (II) to specimens of pus or other material which has, either before or after removal from the body, been exposed to the air, and (III) to any material after it has been inseminated on Musgrave's medium contained in Petri dishes."

In a recent general work on protozoa, the statement is made that "the entozoic amoebae are commonly placed in a distinct genus, entamoeba, distinguished from the free-living forms by little, however, except their habitat and the general (but not invariable) absence of a contractile vacuole:" so it seems permissible to discuss this point again.

Since the presence or absence of a contractile vacuole seems to be the only point of distinction in the amoeba itself, according to this author, it is well to discuss the status of the contractile vacuole.

The contractile vacuole is considered to be the organelle for the excretion of the liquid and soluble products of metabolism.

In the lower amoebae, the contractile vacuole does not seem to be a permanent structure. Commonly, several small vacuoles appear in various parts of the cytoplasm; these vacuoles enlarge and run together until there is one large vacuole that approaches the surface at any point, ruptures and disappears. As we rise in the scale of the protozoa, the contractile vacuoles come to be constant in number and position in the cytoplasm, and finally we get a structure that remains visible even when empty.

Digitized by Google

The contractile vacuole is generally present in amoebae which live in fresh water, and generally absent in parasitic amoebae and in those living in sea water. *Amoeba verrucosa* has a contractile vacuole when it lives in fresh water; but when it is taken into sea water, it loses its contractile vacuole and the entire protoplasm becomes more condensed. When put back into fresh water it regains its contractile vacuole.

So it seems that the osmotic pressure plays an important rôle in the formation of the contractile vacuole.

We assume that in the plasma there develops a solution that is hypertonic toward the surrounding solution. This leads to the taking up of water and the formation of the contractile vacuole. When the taking up of water passes a certain grade, there follows, either through rupture of the elasticity of the protoplasm, or through a fall in the difference in surface tension between the drop in the vacuole and the surrounding fluid, an emptying of the contents of the vacuole.

At once the substance is formed again and the osmotic pressure, that has been equalized, is disturbed and the vacuole is formed again.

In the body of parasitic protozoa and those dwelling in sea water, this solution, hypertonic for the surroundings, is not formed: as a result of the concentration of the surrounding fluid, a gradual equalizing of the osmotic pressure takes place through the entire surface.

From this, it is evident that the presence or absence of a contractile vacuole depends to a great extent on the density of the surrounding fluid.

Vahlkampfiae generally grow readily on artificial media. They are mostly fresh water forms that have been taken in as cysts with the food or have gotten into cultures as contamination.

Wenyon found a small amoeba with a nucleus of the *limax* type in the faeces of a native of India. It was constantly present for the three weeks that the man was under observation, and did not seem to have any ill effect on the man.

Hartmann found a *Vahlkampfia* living in the cloaca of the lizard; Chatton (1910) found another one as an ectoparasite on

Digitized by Google

the skin of fishes; and Chatton and Lalung-Bounaire (1912) found living forms in freshly passed human faeces.

In one case in Florida, I found, in addition to *E. coli* and *T. intestinalis,* numerous vegetative forms of a *Vahlkampfia* (Fig. 1). As the stool had been brought in from several miles in the country, I do not know whether the *Vahlkampfiae* were in the stool when it was passed.

So we must assume that members of this genus may lead a parasitic or semi-parasitic life; and we see that we must go beyond the habitat and the presence or absence of a contractile vacuole to find the points of distinction between the entozoic and the free-living amoebae.

Schaudinn laid stress on the study of the morphology and life-cycle, and the same thing has repeatedly been emphasized since then. I have tried to emphasize the point that the present knowledge of *Ent. coli* and *Ent. tetragena* was obtained from a study of the morphology, especially of the nucleus, and of the life-cycle; the encystment stage being especially characteristic.

I have already spoken of the structure of the nucleus and the cysts in intstinal amoebae, so it remains to discuss the structure of the nucleus and the cysts in the culture amoebae.

The nucleus of the culture amoebae, when stained, shows all of its chromatin collected into a large, dense caryosome; there is commonly no nuclear membrane, or if one is present it is not distinct; there is little or no peripheral chromatin, and the space between the caryosome and the surface of the nucleus is clear, with no chromatin granules and no achromatic network, or only faint indications of one (Fig. 2). The caryosome is dense on the surface and more open toward the center, and one can often see a centriole in the center of the caryosome. That is, it is a typical caryosome nucleus with a large caryosome and a poorly developed outer-nucleus.

The nucleus divides by promitosis and we see the broad pole-caps with the finely granular equatorial plate, the latter being formed from the chromatin of the outer-nucleus (Fig. 3). This nuclear division gives an entirely different picture from what we see in the nuclear division of the parasitic amoebae.

Digitized by Google

As the amoebae begin to encyst, the vegetative chromatin passes out from the caryosome into the cytoplasm, and at that time there is frequently a fine layer of chromatin granules at the surface of the nucleus. This chromatin passes into the cytoplasm and may form chromidia, which are thrown out or absorbed, or which may persist and be seen in the cyst as small granules.

When the culture amoebae encyst, the nucleus does not divide, so we have a cyst with a single centrally placed nucleus (Fig. 4).

This nucleus may still show the chromatin passing off to the cytoplasm. Occasionally, one sees a cyst with two nuclei, but this is probably an abnormality, just as *Ent. coli* cysts with up to sixteen nuclei, as described by Casagrandi and Babagallo, Schaudinn, and Hartmann and Whitmore, are to be considered as abnormalities. I have one preparation of *Ent. tetragena* containing two cysts with six nuclei, which I consider to be abnormalities. In the present state of our knowledge regarding the sexual process in amoebae, one is not justified in considering these two-nucleated cysts of culture amoebae, or the six-nucleated cysts of *tetragena* as evidences of autogamy.

When these culture amoebae are dying, from unfavorable conditions, as from being grown at too high temperature, or cut off from oxygen by allowing the cover glass to remain too long on the surface of the plate in making smears, the nucleus breaks down and chromatin passes into the cytoplasm as chromidia. Whitmore has shown that masses of the cytoplasm are very frequently constricted off, even when there are no chromidia present.

This chromidia formation with budding off of masses from the cytoplasm, has supplied one of the main arguments that the culture amoebae were the same as the parasitic amoebae; but, as we now know that chromidia formation and budding is not the method of cyst formation in the parasitic amoebae, this argument falls.

Another source of error in the chromidia and spore formation described for some of the culture amoebae, lies in the bacteria and protozoa which are not uncommonly parasitic in amoebae, as shown by Nägler, Dobell, Whitmore, and others.

Digitized by Google

The entire question of chromidia and spore formation deserves to be worked over again in the free-living amoebae.

Craig (1913) says, "under abnormal stimulation by adding various substances to culture media * * * in not a single instance has the nuclear structure of the cultural forms been transferred into that of the entamoebae of man." And I would add that in not a single instance has the structure of the cyst of the cultural forms been transformed into that of the entamoebae of man.

Feeding experiments by so many observers have shown the culture amoebae to be unable to multiply in the intestinal tract of man or animals, that some other explanation must be sought for the few positive results reported. The infections were accidental, or the dysentery and liver abscess produced, in Musgrave and Clegg's cases, were caused by the bacteria injected with the amoebae.

The morphology of the nucleus in the vegetative form, the nuclear division, and the cyst, in the culture amoebae is the same, whether the amoeba be grown in cultures made from stagnant water, tap water, faeces, pus from liver abscess, or by exposing plates to the air; and these culture amoebae differ more, in these three points, from the intestinal amoebae, than do the two intestinal amoebae differ one from the other.

Do parasitic amoebae grow on artificial media and change their morphology and life-cycle during such growth?

It is known that species are not permanent or immutable entities; but Williams (1911) says, "Granted that in an occasional individual case fundamental changes may occur on artificial media, in general, changes under these conditions must be quite superficial or we should have to change our idea in regard to the frequency of mutation."

In this case we are concerned with what Minchin terms "*polymorphism in relation to the conditions of life;*" that is, when "the individual is forced to adapt itself to inevitable changes in the environment, or else succumb to their effects." The organism may adapt itself passively, by passing into a resting state (encystment) in which vital activities are temporarily suspended; or actively, by changes in form, structure, and func-

Digitized by Google

tion, adapted to the changed conditions, as takes place in the change of host, where a protozoon has two hosts in its life-cycle.

The intestinal amoebae and the culture amoebae adapt themselves *passively* to the changes of environment by encystment; but the internal structure of the cyst is entirely different in the two cases.

This difference in morphology and life-cycle is not an *active adaptation,* as the culture amoebae cannot change to the morphology and life-cycle of the intestinal amoebae; that is, they cannot be made to become parasitic in man or animals by feeding or rectal injections of cultures.

The comparison between amoebae in cultures and trypanosomes or Leishmania in cultures does not hold, since, in the latter cases, we imitate, in our cultures, the environment in which the parasite finds itself in one of its hosts; and the changes in form, structure, and function, which we obtain in these organisms in our cultures, are probably similar to the changes in form, structure, and function, which these organisms undergo in that (invertebrate) host. Moreover, these organisms can be inoculated from the cultures, back into the vertebrate host, and there take up their normal form and structure for that host.

Nägler has shown that *Vahlkampfia lacertae,* which grows well in culture, and also is able to maintain itself as a commensal in the intestinal contents of the lizard, has the same structure and life-cycle in the cultures that it has in the intestine of the lizard.

From a consideration of these points, it is evident that the culture amoebae differ fundamentally from the intestinal amoebae and could only come from them by complete mutation of species; a condition which is not accepted even by the defenders of the belief that intestinal amoebae have been cultivated.

We can sum up our knowledge of the intestinal amoebae of man by saying that there are two species; one, *Ent. coli,* a harmless commensal, found commonly in the intestinal contents of healthy men in all parts of the world; and a pathogenic species, *Ent. tetragena,* which produces ulcerative dysentery.

The amoebae which have been obtained in cultures from the intestinal contents of man and from liver abscess material, have

Digitized by Google

nothing to do with the true parasitic amoebae; they are the free-living amoebae which are found everywhere, and have gotten into the cultures as cysts that have been taken in with the food and have passed through intact, escaping the action of the intestinal juices; or they have gotten into the material in handling, either from unclean appliances and vessels, or from exposure to the air; that is, as ordinary contaminations; or in some cases they have taken up a parasitic or semi-parasitic existence in the intestine.

While expressing my belief that the parasitic amoebae have not been cultivated, I desire it to be distinctly understood that I am not an opponent of the attempts to cultivate the entamoebae, and I fully expect that they will be cultivated. It is only fair to our culture methods and to the persons who are attempting to improve these methods, to point out the previous failures, and thus to assist in clearing up the difficulties which are to be overcome in order to accomplish the cultivation of the entamoebae.

To-day the all important way of differentiating the free-living from the parasitic amoebae, and of differentiating the parasitic amoebae, one from the other, is by a careful study of the morphology and life-cycle; and the special points to study are the nucleus, nuclear division, and the cyst.

Literature Cited.

Brumpt, O. Precis de Parasitologie. Paris, 1910.

Calandruccio. Atti dell. Ac. di sc. nat. di Catania. 1889-90.

Casagrandi, O., and Barbagallo, P. Entamoeba hominis s. Amoeba coli Lösch. Ann. Igiene speriment, Vol. 7, 1897.

Chatton, E. Protozoaires parasites des branchies des labres, etc. Arch. Zool, exp. et gen., Ser. 5, T. 5, 1910.

Chatton, E., and Lalung-Bounaire. Amibe limax (Vahlkampfia n. g.) dans l'intestin humain. Bull. Soc. Path. Exot., Vol. 5, 1912.

Councilman, W. T., and Lafleur, H. A. Amoebic dysentery. Johns Hopkins Hospital Reports, Vol. 2, 1891.

Craig, C. F. Observations upon amoebae infecting the intestine, etc. Amer. Med., Vol. 9, 1905.

———— Studies upon the amoebae in the intestine of man. Jour. Inf. Diseases, Vol. 5, 1908.

———— The relation of parasitic amoebae to disease. Am. Jour. of Med. Sc., Vol. 145, 1913.

———— The identity of Entamoeba histolytica and Entamoeba tetragena. Jour. Am. Med. Assn., Vol. 60, 1913.

Darling, S. T. Budding and other changes described by Schaudinn for Entamoeba histolytica seen in a race of Entamoeba tetragena. Jour. Am. Med. Assn., Vol. 60, 1913.

Digitized by Google

———— Budding and other forms in trophozoites of Entamoeba tetragena. Arch. of Int. Med., Vol. 11, 1913.

Dobell, C. C. Researches on the intestinal protozoa of frogs and toads. Quart. Jour. of Micr. Sc., Vol. 53, 1909.

Doflein, F. Lehrbuch der Protozoenkunde. Jena, 1911.

Elmassian, M. Sur une nouvelle espece Amibienne chez l'homme, Entamoeba minuta n. sp. Centralbl. f. Bakt., etc., I Abt., Orig., Bd. 52, 1909.

Flexner, S. The etiology of tropical dysentery. Centralbl. f. Bakt., etc., I Abt., Orig., Bd. 28, 1900, and Bull. Johns Hopkins Hosp., Vol. 11, 1900.

Hartmann, M. Eine neue Dysenterieamöbe, Entamoeba tetragena Viereck, Syn. Entamoeba africana Hartmann. Arch. f. Schiffs-u. Tropenhyg., Bd. 12, Beih., 5, 1908.

———— Untersuchungen über parasitische Amöben. I. Entamoeba histolytica Schaudinn. Arch. f. Protistenk., Bd. 18, 1909.

———— Die Konstitution der Protistenkerne. Jena, 1911.

———— Die Dysenterie-Amöben. Prowazek, Handb. d. pathog. Protozoen, Bd. 1, Leipzig, 1911.

———— Untersuchungen über parasitische Amöben. II. Entamoeba tetragena. Arch. f. Protistenk., Bd. 24, 1912.

———— Morphologie und Systematik der Amöben. Kolle u. Wassermann, Handb. d. pathog. Mikroorganismen, Bd. 7, 1913.

Hartmann, M., and Prowazek, S. Blepharoplast, Caryosom und Centrosom. Arch. f. Protistenk., Bd. 10, 1907.

Hartmann, M., and Whitmore, E. R. Untersuchungen über parasitische Amöben. III. Entamoeba coli. Arch. f. Protistenk., Bd. 24, 1912.

Huber. Diskussion. Berl. klin. Wochenschr., Bd. 43, S. 1609, 1906.

———— Untersuchungen über Amöbendysenterie. Zeitschr. f. klin. Med., Bd. 67, 1909.

James, W. M. Infection with Entamoeba tetragena. New York Med. Jour., Vol. 97, 1913.

Jürgens. Zur Kenntnis der Darmamöben und der Amöbenenteritis. Veroffentl. a. d. Geb. des Militärsanitätswesens, H. 20, 1902.

———— Die Amöbenenteritis und ihre Beziehungen zur Dysenterie. Zeitschr. f. exper. Path. u. Therap., Bd. 4, 1907.

Kartulis. Zur Aetiologie der Dysenterie in Egypten. Virchow's Arch., Bd. 105, 1885.

———— Zur Aetiologie der Leberabscesse. Lebende Dysenterie-Amöben im Eiter der dysenterischen Leberabscesse. Centralbl. f. Bakt. etc., Bd. 2, 1887.

———— Über tropische Leberabscesse und ihre Verhaltniss zur Dysenterie. Virchow's Arch., Bd. 118, 1889.

———— Über weitere Verbreitungsgebiete der Dysenterie-Amöben. Centralbl. f. Bakt., etc., Bd. 8, 1890.

———— Einiges über die Pathogenese der Dysenterieamöben. Centralbl. f. Bakt., etc., Bd. 9, 1891.

Lambl. Mikroskopische Untersuchungen der Darm-Excrete. Prager Vierteljahrschrift, Bd. 1, 1859.

Lesage, A. Culture de l'amibe de la dysenterie des pays chauds. Ann. de l'Inst. Pasteur, T. 18 et 19, 1905.

———— Note sur les Entamibes dans la dysenterie amibienne des pays chauds. Bull. Soc. Path. Exot., T. 1, 1908.

Lösch. Massenhafte Entwickelung von Amöben im Dickdarm. Virchow's Arch., Bd. 65, 1875.

Minchin, E. A. An introduction to the study of Protozoa. London, 1912.

Digitized by Google

Musgrave, W. E., and Clegg, M. T. Amebas, their cultivation and etiologic significance. Bureau of Govt. Labs., Manila, Bull. 18, 1904.

Nägler, K. Entwicklungsgeschlichtliche Studien über Amöben. Arch. f. Protistenk., Bd. 15, 1909.

———— Fakultativ parasitische Micrococcen in Amöben. Arch. f. Protistenk., Bd. 19, 1910.

Noc, F. Sur la dysenterie amibienne en Cochinchine. Ann. d. l'Inst. Pasteur, T. 23, 1909.

Schaudinn, F. Untersuchungen über die Fortpflanzung einiger Rhizopoden. Arb. a. d. Kais. Ges.-Amte., Bd. 19, 1903.

Shiga, K. Über den Erreger der Dysenterie in Japan. Centralbl. f. Bakt., etc., I Abt., Orig., Bd. 23, 1898.

Stiles, Ch. W. Reports and Papers. Am. Pub. Health Assn., Vol. 30, 1905.

Strong, R. P. Circulars on Tropical Diseases. 1901.

Strong, R. P., and Musgrave, W. E. Etiology of the dysentery of Manila. Report of the Surgeon General, U. S. Army, 1900.

Viereck, H. Studien über die in den Tropen erworbene Dysenterie. Arch. f. Schiffs-u. Tropenhyg., Bd. 11, Beih., 1, 1907.

Walker, E. L. The parasitic amoebae of the intestinal tract of man and other animals. Jour. Med. Research, Vol. 17, 1908.

———— A comparative study of the amoebae in the Manila water supply, in the intestinal tract of healthy persons, and in amoebic dysentery. Phil. Jour. Sc., Vol. 6, 1911.

Wells, R. T. Aerial contamination as a fallacy in the study of amoebic infections by cultural methods. Parasitology, Vol. 4, 1911.

Wenyon, C. M. Experimental amebic dysentery and liver abscess in cats. Jour. London Sch. of Trop. Med., Vol. 2, 1912.

Werner, H. Studien über pathogene Amöben. Arch. f. Schiffs-u. Tropenhyg., Bd. 12, Beih., 11, 1908.

Whitmore, E. R. Vorlaufige Bemerkungen über Amöben aus Manila und Saigon. Centralbl. f. Bakt., etc., I Abt., Orig., Bd. 58, 1911.

———— Parasitäre und freilebende Amöben aus Manila und Saigon und ihre Beziehungen zur Dysenterie. Arch. f. Protistenk., Bd. 23, 1911.

———— Studien über Kulturamöben aus Manila. Arch. f. Protistenk., Bd. 23, 1911.

Williams, Anna. Pure cultures of amoebae parasitic in animals. Jour. Med. Research, Vol. 25, 1911.

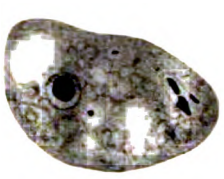
Explanation of Plate.

All figures are from preparations fixed in Sublimate-Alcohol and stained with Heidenhain's or Rosenbusch's Iron Hematoxylin. The drawings were made with Abbe's camera lucida, with the drawing table at the level of the stage of the microscope, with Zeiss apochromatic Obj. 2 mm. and Compens. Oc. 12: magnification about 1950.

Fig. 1. Vegetative form of *Vahlkampfia* from stool of healthy man.

Fig. 2 to 4. *Vahlkampfia whitmorei* Hartmann. Obtained in culture made from liver abscess pus.

Digitized by Google



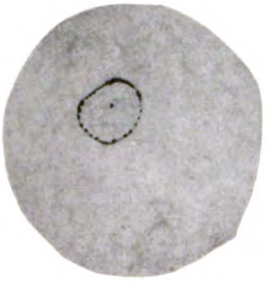
1

2

3

4

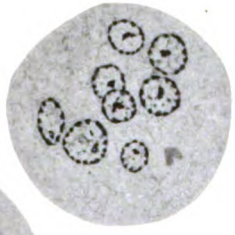
5



6

7

8



11

9

10

Whitmore

Amoebae

Digitized by Google

Digitized by Google

Fig. 2. Vegetative form.

Fig. 3. Nucleus in division.

Fig. 4. Cyst with one nucleus.

Fig. 5 to 8. *Entamoeba histolytica* Schaudinn (or *dysenteriae* Councilman and Lafleur) from dysentery stool.

Fig. 5. Vegetative form showing *tetragena* type of nucleus.

Fig. 6. Vegetative form showing *histolytica* type of nucleus.

Fig. 7. Nucleus in division.

Fig. 8. Cyst with four nuclei and chromidia.

Fig. 9 to 11. *Entamoeba coli* Lösch from stool of healthy man.

Fig. 9. Vegetative form with simple caryosome.

Fig. 10. Vegetative form with spindle-shaped caryosome.

Fig. 11. Cyst with eight nuclei.

Digitized by Google

DISEASE CARRIERS AMONG SCHOOL CHILDREN.*

By EDWIN O. JORDAN, Ph. D., University of Chicago.

More favorable opportunities for the dissemination of infectious disease could hardly be devised than those offered by the school. In the average schoolroom from thirty to fifty or more children are kept for some hours each day under conditions involving fairly close personal contact with a considerable number of their fellows. Two factors accentuate the danger of infection: first, the relatively high susceptibility of children as compared with adults; second, the unconventional habits of many children with respect to care of fingers, mouth, and nose. If a child enters the schoolroom bearing the germs of disease, it is relatively easy for the spark of contagion to be communicated to the highly inflammable material there gathered.

All that is known about the modes of transference of disease strengthens the opinion that more or less close association of living human beings is one of the chief agencies in spreading infection. Transfer of disease for any considerable distance through the air, or by the agency of lifeless objects, seems to be relatively uncommon. When the germ of Asiatic cholera enters the United States, it is not in clouds of microbes blown across the Atlantic, rarely if ever in infected rags or clothing, but as a rule in the bodies of human travelers who may or may not display symptoms of the specific malady. In most infectious diseases the trend of discovery has been toward emphasizing the importance of the living human disease carrier as contrasted with inanimate objects.

It is true that the schools have for long enforced regulations which constitute a partial recognition of these facts. Children known to be ill of certain diseases are in general promptly excluded from the school. Even after recovery has set in, a period of quarantine is usually exacted before the child is readmitted. In some diseases, however, in which the symptoms are not acute, or in some localities where the popular fear of particular diseases is not great, little or no restriction of the disease carrier is practised. Children or teachers ill with pulmonary tuber-

* Read at the International Congress on School Hygiene, Buffalo, September, 1913.

Digitized by Google

culosis are in some cases allowed, knowingly or unknowingly, to mingle with the healthy. Children suffering from whooping-cough are allowed to attend school in at least three cities in this country.[1] Such neglect of frank or manifest cases of disease, however, is coming to be quite exceptional, and the greatest danger from disease carriers at the present time is not from this source.

The precise length of quarantine to be required before a convalescent child can safely be readmitted to school has given, and still gives, a good deal of concern to public health officials. Before the days of bacteriology the period during which an individual convalescent might continue to be infectious was purely conjectural, and the length of quarantine then enforced was based roughly on experience as to what had usually happened when convalescents had been allowed to go about among the susceptible. Even now diphtheria is practically the only common disease of school children in which we can assure ourselves by bacterial examination that the convalescent child no longer harbors the germ of the specific infection. We cannot be certain that in exceptional cases a child may not continue to carry the germ of certain diseases, such as scarlet fever or whooping-cough, beyond the conventional isolation period. One result of this uncertainty has been to incline public health authorities to lengthen the time of quarantine for some diseases to a point probably far in excess of the actual necessities. While the wish to "take no chances" and to "be on the safe side" is a laudable one, it must be remembered that the aggregate inconvenience and loss of time to the community from quarantine restrictions is at present large and should be reduced as far as practicable. The duration of the necessary isolation period in certain diseases needs careful and detailed study. Present regulations are based to a certain extent upon unverified tradition. A beginning has been made in the right direction by the fine work of Anderson upon measles, where it is shown that in monkeys the disease is rarely transmissible from one animal to another after the febrile stage has passed. It has been the custom in many places for the health authorities to require a quarantine of twenty-one

1. Morse, J. A. M. A., 1913, 60, p. 1677.

Digitized by Google

days after the onset of measles! This is probably much longer than necessary. From my own observations I believe that a careful study of the epidemiology of measles would give results wholly in accord with Anderson's experimental work. There seems to be no trustworthy evidence, experimental or epidemiological, that measles can be conveyed by a convalescent patient for more than a brief period after the eruption.

Although it is true that in most cases the conventional period of quarantine is long enough, even over long, to meet the actual requirements for exclusion of convalescent disease carriers from the schools, it must not be forgotten that there are still more insidious sources of danger to reckon with. The unrecognized cases and the healthy germ-carrier offer serious problems to the school authorities.

Unrecognized cases of the ordinary infections of childhood are fairly common. Most infectious diseases run a "mild" or "atypical" course in certain individuals. Whether this be due to differences in individual susceptibility or in the virulence of the invading germ, the practical outcome is the same, namely, that in every community there exists at times undiagnosed or missed cases of certain diseases against which the usual safeguards are not maintained. Such missed cases are at present an important factor in the spread of disease in school. Their occurrence emphasizes the need of paying attention to slight and apparently trivial indispositions. Systematic medical inspection is useful not only in observing remediable defects in school children, but in detecting the presence of disease carriers, who may not themselves be seriously ill, but who may menace the health of their school-fellows. There is no security that a pathogenic microbe which is producing an insignificant disturbance in one child will not, when transferred to another, lead to serious consequences. The detection of a mild or incipient case of infection will undoubtedly prevent some extensive school epidemics.

I am aware that some observers regard school attendance as a minor factor in the spread of scarlet fever and diphtheria. There is much expert opinion and some evidence to support this view. Since I have recently discussed this phase of the sub-

Digitized by Google

ject elsewhere,[2] I need not refer to the matter here further than to point out that the known facts regarding the bacteriology and modes of transmission of diphtheria favor the view that many extensive outbreaks of this disease are of school origin. The relative proportion of all diphtheria infection that can be attributed directly to school attendance needs further and more extensive investigation.

Whatever be the truth as regards diphtheria and scarlet fever, there can be no doubt that measles may properly be called a school disease. Most of the investigated cases of measles among school children can be traced very directly to school infection. In an outbreak of measles that came under my observation in March and April, 1913, among the children attending the elementary school of the Department of Education of the University of Chicago, the influence of school attendance was clearly shown. While about one-half of the school population (281) was susceptible, 66 per cent of the susceptibles in two grades (22 in 33) were attacked, and less than 10 per cent (10 in 107) in the rest of the school. The children in the two grades affected had been associated in the rehearsal of a play, and during this period one child in the early stages of measles was attending the sessions of her grade. All but one of the primary cases were in these two grades, and 6 of the 10 secondary cases occurring in other members of the school were in families in which a primary case had occurred.

An interesting description of a measles epidemic in Richmond, Va., in 1910, has been given by Levy.[3] Particularly suggestive are the statements made regarding the cross-action of day schools and Sunday schools in causing a wide dissemination of the infection.

"A case would develop in a day school. Being highly contagious before the eruption appeared (with the child still going to school), other cases would develop in this room later, and these, in turn, would be highly contagious before it was recognized that they were ill. Meanwhile, though in one room at school, these children attended a number of different Sunday

2. Jordan. Jour. Amer. Med. Assn., 1913, 60, p. 409.
3. Report of Health Dept., Richmond, Va., 1910, pp. 34-39.

Digitized by Google

schools, thus giving rise to many cases in each of these Sunday schools. As the latter children attended many different schools through the week, the disease was thus introduced to these schools, and so on."

In this carefully studied measles outbreak at Richmond it is important to note that Levy and his associates found that the disease in every case was contracted by exposure to some other case, and was not in a single instance spread by a third immune person or by articles which had been in contact with a case. Raffle,[4] Kingsford,[5] and Woody[6] have also emphasized the importance of school attendance in spreading this disease.

No excuse need be made for dwelling on the importance of measles as a school disease. In the United States in 1910 there were about 6600 deaths reported from this cause in the registration area. At the same ratio this means at least 11,000 deaths in the whole country, a number which would be considerably increased if the deaths reported as caused by bronchitis and broncho-pneumonia, but really due to measles, could be included. Scarlet fever, a disease popularly much more dreaded than measles, caused in 1910 fewer deaths than measles in the registration area.

A disease which is so serious as measles and so unmistabably spread by the agency of the schools should receive special attention from the school authorities. It must be remembered that the chief danger of spreading measles infection occurs in the early stages before the eruption has appeared and when the child is apparently suffering only from a slight cold. Acting on this knowledge, English health officials report much success in the control of measles by what is termed the "short early closure of schools." In this system, the class is dismissed for a period of five days, nine days after the sickening of the first case, the object being, of course, to secure the exclusion of the unknown children infected by the firt case at the time these are most likely to infect other children. In the English borough, Stoke-on-Trent, where this method was applied in 1912, short early closure was resorted to on thirteen occasions, on four a

4. Lancet, Feb. 3, 1912, p. 294.
5. Med. Officer, 1912, 7, p. 207.
6. Proc. Path. Soc. of Phil., 1912, 14, p. 158.

Digitized by Google

whole department was closed, on nine a single classroom. Although several children sickened at home during the period of closure, there was not a single instance in the whole thirteen occasions of the occurrence of subsequent cases in the school after the return of the children.[7] It may be suggested that under suitable conditions this method may be made less drastic by causing it to apply only to the susceptible children. Those children who have previously had measles, if sufficiently numerous, may proceed with their work without interruption. Second and third attacks sometimes occur, but whether these are sufficiently common to be of importance in general disease prevention seems doubtful. In view of the serious character of measles as a disease, as well as its importance in interfering with school work, it is desirable that parents generally should have knowledge of the chief mode of spread. There is reason to believe that the precise period at which children are dangerous as carriers of measles is not so widely known as it should be. Many outbreaks have been traced to infection communicated by children supposed to be suffering from more or less severe "colds," but really in the initial stages of measles.[8] Exposure of a susceptible child to measles should be sufficient ground for keeping that child away from other susceptible children for one week beginning eight days after the date of known exposure. Parents should be made aware of their responsibility in this matter. Even with the widest campaign of education, however, there will probably always be enough cases in which exposure is unknown to make the English method of school closure or some such procedure well worth adoption by school authorities.

Another disease that is probably largely disseminated through school agency is whooping-cough. Like measles, the seriousness of whooping-cough is commonly underestimated, and Morse[9] has lately made a strong plea for the more efficient control of this fatal disease. Whooping-cough is most serious in infants and young children and for this reason less attention is paid to the disease when it occurs in children of school age. In many states and cities in this country neither isolation nor notification

7. Med. Officer, 1913, 9, p. 283.
8. See for example, Young, A Measles Outbreak in Chicago, Am. Jour. Public Health, 1912, 2, p. 791.
9. Jour. Amer. Med. Assn., 1912, 60, p. 1677.

Digitized by Google

of whooping-cough is required, and in some places even active cases of the disease are not excluded from school. The long and tedious course of the malady and the slight constitutional disturbance usually caused in older children explains sufficiently the difficulty of enforcing any sort of restriction. At the same time it must not be forgotten that most of the cases in children of school age are contracted away from home, and that the infection is carried by them to the younger children of the same household. As in measles, so in whooping-cough, it is important to know the fact that a child has been exposed to the disease. Reasonable precautions may then be taken to avoid transference to children under five years of age, since it is among these younger children that 95 per cent of all deaths from whooping-cough occur.

We know that in some diseases, typhoid fever and diphtheria for example, perfectly healthy persons who have no symptoms of the specific disease and so far as known never have had, are yet carriers of disease germs which, when transferred to another individual, are capable of producing typical attacks. In some instances such healthy carriers are known to have been in contact with acute cases or convalescents, in others no such association can be traced. Cerebrospinal meningitis in particular seems to be largely spread through the agency of healthy carriers. "By comparison, the influence exerted upon the spread of the disease by the actual cases of meningitis is probably quite inconsiderable." (Ledingham.)

From the standpoint of preventive medicine it is important for schools to guard against transmission of disease by (1) children in the very early stages of some infections, notably measles, (2) children suffering from mild attacks of diseases like whooping-cough and diphtheria, (3) children who have been in contact with recognized cases of disease although not themselves visibly affected; diphtheria and meningitis carriers seem to be especially likely to be produced in this way.

Above all, detailed, expert study of epidemics among school children will undoubtedly throw much light upon the real responsibility of schools in facilitating the diffusion of disease through the community.

Digitized by Google

ANOPHELES AND MALARIA.*

FREDERICK KNAB,
Bureau of Entomology, U. S. Department of Agriculture.

A few errors occur in my paper on pages 33-43 of this JOURNAL. Those in the lists of specific names of *Anopheles* are particularly unfortunate, as they add to the already existing confusion in the nomenclature. On page 36, line 7 from top, "*eiseni* Coquillett" should be substituted by *crucians* Wiedemann. On the last line of the same page the name *tucumanus* Lahille does not equal "*punctipennis*" but *pseudopunctipennis* Theobald. On page 37 the name of the second of the unrecognized species at the top of the page is not "*punctipennis*" but *pictipennis* Philippi. Although this last is described as a *Culex*, it is undoubtedly an *Anopheles*, and probably a female and not a male, as stated, Philippi having taken the long palpi as a sexual diagnostic. This error, and the reverse one of taking a male culicine for an *Anopheles* on account of the long palpi, has been committed by a number of authors. The description of *Culex pictipennis* is not sufficiently detailed to admit of certain identification. There is reason to suspect, however, that it is identical with *Anopheles albitarsis* Arribálzaga and *A. bigotii* Theobald, in which case *pictipennis* has priority. Good material from Chile alone can settle the question. Finally, on page 39, lines 12 and 13 from the bottom of the page should be transposed. The sentences should read: "These *Anopheles*, however, are not satisfied with this, but continue to suck, making more room by discharging the surplus through the anus. At first they discharge the fæces and intestinal liquid, but afterwards, drop by drop, pure blood follows."

In the discussion on page 43, Dr. H. R. Carter states that *Anopheles malefactor* breeds in water in hollow tree stumps. The doctor apparently had in mind *Anopheles eiseni*, which has been well established to be a tree hole breeder. All our records show that *Anopheles malefactor* breeds in quiet pools in stream beds and in similar situations.

*Received for publication July 31, 1913.

Digitized by Google

SERUMS AND VACCINES IN THE PREVENTION AND TREATMENT OF UNDULANT FEVER.*

By A. PARKER HITCHENS, M. D., Glenolden, Pa.

Within the past two years undulant fever has been transferred from the list of exotic infections to the class of diseases endemic in our own country. Ferenbaugh[1] found undoubted cases of undulant fever in the Pecos River country in Texas where goat raising is carried on extensively. Gentry and Ferenbaugh[2] continued the investigation, demonstrating that in a large section of territory along the Rio Grande the goats are undoubtedly affected with the disease. Physicians in the neighborhood believe that it has existed there for upwards of twenty-five years. In discussing the origin of Malta fever in this country it has been noted that the first pure-bred Angora goats were imported in 1867. More recently, however, they have come almost exclusively from South Africa. The importation from Malta in 1905 through the agency of the Department of Agriculture[3] on the "Joshua Nicholson" is important historically, since developments during the voyage served to demonstrate for the first time that the disease is contracted from infected goats by drinking their milk.

The first report of a case of Malta fever originating in this country was made by Captain Craig[4] of the United States Army in 1905. This patient, it is thought, contracted the disease from nursing an infected soldier. Nine other cases of Malta fever among soldiers are referred to, but these men were infected in the Philippines.

If the disease has been present in Texas for twenty-five years it seems likely that it has not been confined exclusively to this region. It would be odd if some of the cases of mild, remittent fever seen in other parts of the country occasionally were not melitensis infections. This supposition is strengthened by the fact that Yount and Looney[5] have reported five cases in

*Read by title at the Tenth Annual Meeting of the American Society of Tropical Medicine, held in Washington, May 6, 7, and 8, 1913.

Digitized by Google

Arizona. Since the neighboring States of New Mexico, Oregon and California are also centers of the goat raising industry, investigation would undoubtedly show not a few cases of the same disease.

The serodiagnostic method that has been in most common use is the agglutination test as first suggested by Wright.[6] The serum of normal animals will sometimes agglutinate the *Micrococcus melitensis,* and for this reason there has been much discussion concerning the point at which a reaction can be considered indicative of melitensis infection. Another difficulty is due to variations in strains; Negré and Raynaud[7] refer to para-melitensis, and Nicolle and Conor[8] state that Bruce, himself, isolated such a sub-species. Zammit[9] showed that not only the serum, but the milk of infected goats may be used for the agglutination test. Sicré,[10] Mohler and Eichhorn,[11] and Missiroli[12] have suggested the use of the complement fixation test. Sicré and Mohler and Eichhorn consider this an improvement upon the agglutination test. Sicré found no variations with different strains as are constantly met with in the agglutination test, while Mohler and Eichhorn think a positive reaction will probably be definitely diagnostic of infection. Missiroli, as a result of the more precise application of the complement test, declares that there are the same variations in the intensity of the reaction with different strains. Attention is called to this discussion merely to point out its bearing upon the serum and vaccine therapy of the disease. Much stress is being laid at the present time upon variations in species; for instance, it has been shown by Neufeld and by Cole that there are distinct varieties of pneumococci which apparently have no relation to one another in their immunity reactions. Variations in type of different strains of the Micrococcus melitensis suggest that Malta fever vaccine or serum to be of greatest value should be polyvalent.

The first attempt to prepare a serum for the treatment of Malta fever was made in 1895 by Wright, who treated goats with subcutaneous injections of killed cultures. He found that the serum of the goats exhibited neither protective nor curative properties and that its agglutinative power was low. Consequently the next year he injected a horse in the same way.

Digitized by Google

Wright arrived at the curious conclusion that anti-bacterial serums depend for their activity on unchanged or unneutralized antigenic substances still existent in the blood of the horse. It is difficult if not impossible to reconcile this opinion with current theories concerning anti-bacterial sera, and especially with our conception of the function of the serum of immunized animals in sensitizing bacteria for use as vaccines. However, the serum of the horse treated by Wright was used therapeutically and a few of the results have been recorded.

Aldridge[13] treated five cases; two of these in the sixth and ninth weeks of the disease were not affected; the third case, a severe one, with great prostration and fever of several weeks duration with only one partial remission, showed marked improvement on the day following an injection of 20 c. c. of serum. The temperature came down and remained normal from the eighth day after injection; a relapse occurred after three weeks, but the temperature again came down three days after another dose of 15 c. c. This improvement, like the other, was not permanent, and for want of more serum the treatment was not continued. The other cases were recent and uncomplicated; in one of them 30 c. c. of serum were injected on the fifth day of the disease. The temperature, which had reached 106°, gradually fell until it ranged between normal and 101°. As it showed a tendency to rise again on the fourteenth day, another dose of the same size was given; following this the temperature did not rise again above 100° from the third day after. The fifth case received 30 c. c. of serum on the ninth day. The temperature, which had already shown a tendency to come down to between 101° and 102°, reached normal on the third day after the injection. Fitzgerald and Ewart[14] treated an officer who had been ill for five months, during which time his temperature had never remained normal for more than a week or ten days together. The writers state that in answer to a letter of inquiry Major Semple informed them that experiments were being carried out at Netley, that there were at Netley some fifty cases, including both Professor Wright and himself, and further that whereas all drug treatment had failed, marked benefit followed the use of serum. The patient was given three doses of 20 c. c.

Digitized by Google

each. A troublesome attack of urticaria followed the last dose, the symptoms of which gradually subsided, the temperature falling at the same time. Eight days after this injection it was normal and the patient was convalescent. At the time of reporting the case there had been no recurrence.

In 1905 Shaw,[15] working with the English commission, tested the therapeutic value of the serum of a goat which had been used previously for experimental purposes. It had frequently been given subcutaneous injections of M. melitensis in large quantities; its agglutinin titre was 1:3000. Two months after the last injection the animal was bled and the serum was tried therapeutically upon two monkeys, with entirely negative results. Shaw says that there was not enough difference between the clinical features of the treated monkey and the control to encourage a strong belief in the successful development of a curative serum. Cultures made from this bleeding showed the presence of living micrococci. Consequently it is difficult to understand on what Shaw based his supposition that this serum might have curative value.

The work of Eyre[16] did not give results so encouraging as anticipated, but he established certain points worthy of attention. Like Wright, he first used goats, but in 1905 he treated a horse. The goat was not deemed satisfactory because intravenous injections of killed cultures did not increase the agglutinin index beyond 1:200 and living organisms even of low virulence remained alive in the circulating blood for months. After two months' treatment the horse was receiving 250 milligrams of killed culture. The agglutinin titre being only 1 to 5, the doses were then given intravenously, and finally living cultures were administered by the same route. When the horse had been under treatment for six months the quantity of living micrococci given at a single dose had reached 3,000 milligrams and the agglutinin titre had increased to 1:3,000. Cultures failed to reveal the presence of any living micrococci in blood drawn within about three weeks of inoculation, but the injection of the blood into animals showed that a sufficient number of cocci were present to cause a fairly acute infection. By the end of about four weeks after injection, however, the blood was sterile.

Digitized by Google

The question of protective properties in the blood of this horse may be easily dismissed. In no case did the subcutaneous injection of even large quantities of serum prevent the subsequent infection of the experiment animal by a standard dose of micrococcus melitensis injected intracerebrally or do more than slightly retard a fatal termination. When, however, 1/10 c. c. of serum and a standard dose of micrococci were injected simultaneously into the cerebral tissue, the animal remained unaffected. Monkeys were injected subcutaneously with one-tenth of a loop full of a 24-hour culture of melitensis emulsified in 1 c. c. of normal saline. Eight days later signs of infection were apparent. Two were set aside as controls, three others received 3 c. c. of horse serum subtunaeously for eight days, and the sixth 3 c. c. directly into the saphenous vein daily for the same period. Simple physical observation of the infected animals was insufficient to distinguish between those treated with the serum and the controls. Serum was also used for the treatment of one human case, but beyond steadying the pulse and bringing it down from 108 to 96 per minute, a result which might equally follow a single injection of normal saline solution, no other effect could be detected.

The results obtained with the serums prepared by Wright and Eyre were so far from encouraging that little interest has been shown in the serum therapy of Malta fever by English observers since the publication of the English Commission's report. During the last few years there has been a renewal of interest through the work of Professor Trambusti[17] and his assistant, Professor Donzello of Palermo. Trambusti, in studying the work of Eyre and attempting to improve upon it, decided to treat his animals with a nucleoprotein derived from the micrococci by the method of Lustig and Galeotti. Numerous favorable reports are appearing in the Italian journals telling of cases that have been treated with the Trambusti-Donzello serum, but apparently only the successes are reported, and these are but small groups of cases.

For the preparation of the serum a young goat was immunized with the nucleoprotein and the product was tested upon rabbits of about 500 grams weight. The rabbits were infected subcu-

Digitized by Google

taneously with 3 c. c. of serum from the immunized goats. The rectal temperature of these rabbits, which had been on the preceding day 39.5°, diminished to 38° and remained at this point for some days, when the animals rapidly recovered and gained in weight. On the other hand, the control animals died after eight days. Two monkeys treated with serum remained in good health while two controls continued to lose weight, the temperature remaining high until one of them died. The other was saved by repeated injections of anti-melitensis serum. It was then decided to test the efficacy of the serum upon man. In June and July of 1908 a patient was treated who became entirely well after only two injections.

Morpurgo[18] mentions three cases treated successfully with the Trambusti-Donzello serum. He says that the inejctions made into these patients caused no local reactions. According to him, the Institute Pasteur of Tunis has for some time been preparing a serum against Mediterranean fever, but the results obtained in the majority of cases have not been satisfactory. Missiroli[19] says that the Trambusti-Donzello serum is most efficacious in cases of Malta fever which have existed for only one to two months. In these it succeeds in bringing the disease to an end within a few days. In cases of longer duration than six months it shows some efficacy if it be used in large doses. He has treated four cases, all of which recovered rapidly. The temperature charts of three of these show that the temperature reached normal five or six days after the first injection. These three cases received only two injections each of 10 c. c. on two successive days. The fourth was given five injections of 10 c. c. each at two-day intervals. This case, however, showed certain phenomena apparently due to hypersensitiveness, but recovery from the disease was rapid and otherwise uninterrupted.

Tomaselli[20] treated a patient with two doses of this serum given on successive days. The temperature came down to normal on the sixth day after the first injection. In this case the agglutinin titre was 1:1000 while the reaction was negative in all dilutions to the typhoid bacillus, the paratyphoids and *B. coli*.

Morpurgo[21] reports two more cases in which he says the efficacy of the anti-melitensis serum cannot be doubted. In the

Digitized by Google

case first mentioned the first injection of serum was given on the 7th of August, in the morning, and the temperature at that time was 37.2°, rose in the evening to 39.8°. The next morning it was down to 38° when a second injection of serum was given. The evening temperature rose to 39°. On the 9th of August it was 37° and 38°; on the 10th, 37.2° and 38.5; the 11th, 37.7° and 38°. On the succeeding days the temperature gradually descended, reaching normal on the 15th. The second case received two injections on successive days and the temperature came down to normal within three days after the first injection.

Balduzzi[22] reports the treatment of three cases of Malta fever in which the diagnosis was made by the agglutination reaction. The first two cases were tested likewise with regard to their agglutinin titre to typhoid, paratyphoids and coli. Two injections of serum of 10 c. c. each were given on successive days. The third patient received two injections on the same day. Two days later she aborted at the third month with retention of the placenta, which necessitated an operation. Phlegmasia alba dolens developed, but with resolution, which occurred in about twenty days, the fever disappeared, and the patient began to convalesce.

Natale[23] has had occasion to treat two patients with this serum. The first was an infant of two and a half years with the remittent type of undulant fever. The agglutinin reaction was positive in a dilution of 1 : 500. An injection of 10 c. c. of serum was given, followed in twenty-four hours by another of the same size; three days later the temperature became normal and the patient recovered. The second patient was a young man of 25 who had the intermittent type of fever, but who also had an enlarged spleen which raised a suspicion of malaria. Quinine, however, had no effect upon the fever. The agglutinin reaction was positive in sufficient titre to admit the possibility of infection by the *M. melitensis*, and two injections of serum at the usual interval were followed by loss of fever within two days, and the patient rapidly became well. Another case is noted which, according to Natale, is of interest in showing the specificity of the serum. This patient was a woman who two months after parturition developed a temperature which led one to suspect un-

Digitized by Google

dulant fever. The agglutinin reaction was positive in a dilution of 1 : 80. Following serum treatment there ensued a marked modification of the temperature, which went down from 40.7° to 36°. This was only temporary, however, for very soon the fever took an atypical course with a maximum rise to 38.5°. Small doses of quinine modified the fever at this time, although earlier even larger doses had had no effect. A thorough examination of the patient revealed a small focus of infiltration under the right scapula and a cutaneous reaction confirmed the suspicion of tuberculosis. The author believes that this patient actually had a Malta fever infection, which was cured by the serum.

Prphylactic Use of Vaccines.

The prevention of undulant fever by vaccination has an interest somewhat apart from its scientific value in that the first attempt at immunization was made upon Sir Almroth Wright (Birt and Lamb[24]). During January and February of 1898 he took three doses consisting of 1/50, 1/25, and 1/25 of an agar culture of *M. melitensis* killed by heat, and about 15 days after the last he inoculated himself with 1/100 of an agar culture of living micrococci. About two weeks later he began to show symptoms of the disease. The attack was a sharp one although of comparatively short duration.

Shaw[25] made some experiments upon monkeys to see whether or not a previous attack of undulant fever might confer immunity to a second attack. He found that monkeys which had previously had an attack of fever reacted much less markedly than the controls to a dose of living *M. melitensis*. Shaw concludes that a previous attack does confer some protection against subsequent exposures.

Eyre[26] states that the probable value of preventive inoculation has not the experimental support that is available in the case of other diseases. Long continued treatment of rabbits and guinea pigs by injections of killed cultures provokes the formation and maintenance of a high agglutinative power in the blood, but such injections not only fail to protect the animal against the living virulent culture, but in some cases appear to render it more susceptible.

Digitized by Google

Recent developments in our knowledge of anaphylactic phenomena in relation to infection may throw some light upon Eyre's observation that "in some cases the animals appear to be more susceptible." In laboratory experiments one aims to use as the infecting dose of bacteria a quantity that will certainly kill every untreated animal injected. Sometimes this dose is much greater than that the animal would receive naturally and the route of infection is often one that would never be followed if the animal contracted the infection in the ordinary way. According to the hypothesis of Vaughan, acquired immunity to a bacterial infection is due to ferments existing in the body as the result of the previous parenteral exhibition of the same bacteria or their specific proteins. Infection fails because the bacteria taken into the body are split up by these ferments and as cleavage products of bacterial proteins are eliminated. The animal is immune as long as there is sufficient ferment to split up and thus to destroy all the living germs received. If, however, the dose of living germs is overwhelmingly large, not only are the ferments insufficient in amount to prevent growth, but they further increase the susceptibility of the animal by the destruction of some of the bacteria, thus setting free a quantity of the toxic portion of their proteins. A greater or less number of the bacteria remain alive and the toxic portion acts for them like an aggressin. An immunized animal is, therefore, more susceptible to an overwhelming dose of bacteria than a normal animal.

Eyre attempted the immunization of 51 men, soldiers and sailors stationed on the Island of Malta. They were given vaccine in doses of from two to three or 400 million cocci as the initial injection. Two doses at suitable intervals was the rule, but the second dose, while regulated by the response of the individual to the first injection as observed by the agglutinin curve, was usually 400 million cocci. Forty-one (41) sailors were available for the experiment; twenty-one (21) were injected and twenty (20) served as controls. They were under observation from April 27 to August 30, 1906. During this period one of the controls contracted the disease, but no cases occurred among the vaccinated men. Sixty-eight (68) soldiers were avail-

Digitized by Google

able for the experiment and 30 of these were inoculated, while 38 served as controls. Fifteen (15) of those vaccinated received one injection only, while 15 received two. During the four months from April 26th to August 30th, 1906, two cases occurred among the non-vaccinated controls and none among the vaccinated men. At the beginning of September, however, two cases occurred among those vaccinated. It was noted that a very distinct fall in the titre of the serum of the vaccinated persons had taken place by the end of the four months. This indicates to Eyre the necessity for a further inoculation at about the end of three months; he believes that prophylactic inoculations have distinct value.

Whether or not doses as large as those usually given for typhoid immunization, that is, three doses of 500, 1000 and 1000 millions respectively, given at ten-day intervals, would confer a longer period of immunity, is a question which might be the subject of a profitable investigation.

Since goats are the chief carriers of undulant fever, the question of the eradication of the disease immediately suggests a campaign of wholesale vaccination of these animals to prevent further infection among them as well as the elimination of the disease by the therapeutic use of vaccine. To investigate the possibility of accomplishing this, Eyre, McNaught, Kennedy and Zammit[27] selected six milch goats and one sheep, four of which were treated while three served as controls. The milk from all these animals usually contained the *M. melitensis* in enormous numbers. The value of the experiment upon these animals was unfortunately vitiated by the drying up of their milk. The vaccine given them contained 1000 million micrococci per c. c. One animal whose milk did not dry up contained melitensis in undiminished numbers throughout the experiment. In the treatment animals the cocci underwent a certain diminution after the second injection and a still further diminution after the third, although in no case did they disappear entirely.

The problem of preventive inoculation has been investigated by Vincent and Collignon, who[28] selected four young goats about six months old and in perfect health for immunization against *M. melitensis*. The vaccine was prepared by the method of

Digitized by Google

Vincent. Living cultures three days old were emulsified in physiologic salt solution and ether was added. The mixture was shaken vigorously for one or two minutes, and then allowed to stand for 24 hours at the temperature of the laboratory. The ether was evaporated by allowing it to stand for some minutes at 38° C. Inoculations were given subcutaneously or intravenously at 8 to 10 day intervals. The animals injected subcutaneously received three doses, while those injected intravenously received only a single dose. Those which had received three injections of vaccine subcutaneously manifested no abnormal symptoms whatever to the test inoculation of 4 c. c. of living culture. They were observed six months later and found to have developed into large, healthy animals. Cultures of the blood remained negative and the serum showed a high agglutinin titre. The animals which had received one intravenous injection showed much less resistance to the infecting dose. They had fever up to 40° C. for a day, loss of appetite and diarrhea for three days, they lost in weight, but the symptoms did not persist and they rapidly regained normal health. The authors are still studying this question, paying particular attention to the duration of the immunity.

At variance to these favorable results of Vincent and Collignon are the experiments of Panto.[29] Panto used a large ram and four little Maltese goats about five months old. Two of the latter served as controls. The vaccine was prepared by the method of Pfeiffer, that is, a large agar culture of the *M. melitensis* three days old was emulsified in sterile physiologic salt solution. The cocci were killed in a water bath at 60° C. for two hours, 0.3% phenol was added and the vaccine sealed in sterile vials each containing 5 c. c. These were then exposed for another half hour in the water bath at 60° C. The animals were injected with this vaccine, and after a suitable interval were fed cultures of living micrococci by mouth. Each animal contracted the disease, and at autopsy positive cultures were obtained from the spleen and the osseous medulla. All cultures from the circulating blood and liver remained sterile. As a result of his experiments, Panto believes that there is no ground for the suspicion that such a method of prophylaxis is destined

Digitized by Google

to render any genuine advantage in the fight against undulant fever.

Experience in the preparation of other bacterial vaccines would lead one to think that on account of the long continued heat used in preparation there was very little specific antigenic substance left in the vaccine used by Panto. For this reason it is felt that not even negative value can be accorded his observations.

Therapeutic Use of Vaccine.

The vaccine has been used therapeutically with some measure of success. S. T. Reid[30] used a vaccine that was made from micrococci grown on ordinary agar for four days. The culture was suspended in broth, heated on a water bath at 65° C. for one-half hour and tested for sterility. Thirty-six (36) inoculations are recorded with beneficial results following all of them. In most cases the first effect of inoculation was to raise the temperature. This corresponds to the negative phase and never lasts more than forty-eight hours. As soon as the system responds and produces protective substances the temperature drops and in most cases becomes normal. Vaccine relieved the pain which was the chief symptom in six of the cases. It is stated that inoculations in proper dosage will produce such improvement in a subject debilitated from melitensis infection that his weight will record a gain of at least one-half pound a day.

The vaccine used by Basset-Smith[31] was prepared from cultures grown on agar for ten days, the growth was emulsified in water, killed at 60° C., and 0.5% carbolic acid was added. The vaccines were generally given at ten-day intervals unless the clinical symptoms contraindicated their use. Altogether 224 injections were given. Most of the men believed strongly in the efficacy of the injections and asked for their repetition. In the more chronic cases having the very common secondary nerve and arthritic pains the vaccines appeared to produce at least temporary improvement in some instances. In some cases the gain in weight was remarkable, being as much as one-half to one pound a day. In many patients the fever undulations were curtailed or reduced in severity after the administration of the

Digitized by Google

vaccine. Bassett-Smith calls attention to the great difficulty experienced in estimating the value of any method of treatment whatsoever, since this disease is one characterized by irregular course, long latent periods, and unexpected recrudescences. In the more acute type with high fever and evidence of severe intoxication the method appears to have a deleterious instead of a favorable action. In commenting upon this latter statement Allen[32] exxpresses the opinion that the doses were too large. *One-fourth* c. c. of the vaccine used contained 468,750,000 cocci and the initial dose was usually one-fourth c. c. Sometimes 1/10 c. c., sometimes 2/10, and sometimes 3/10 were given. Allen thinks that the administration of much smaller doses, as is customary in streptococcal and gonococcal septicemias, might possibly have been followed by more favorable results.

The case noted by Wright[33] was studied with regard to its opsonic index and agglutinin curve during the treatment. It was seen that the temperature rose in the negative phase and started to come down very soon after the positive phase as a rule.

Brancati[34] has used a vaccine prepared by the method of Wright for the treatment of 15 cases. This vaccine was standardized so that one c. c. contained 100 million dead cocci. The patients were at various periods in the infective process, some were recent infections, others from two to four months standing. Those in which the vaccine gave immediate results were acute cases with elevated temperature and grave course. The temperature was brought down within 24 hours and it did not rise again. With the disappearance of the fever all the clinical phenomena were ameliorated and in a few days the patients were well. In other cases the temperature ended by lysis and fever disappeared completely in about eight days. Patients who had been ill for two months or more, with a few exceptions, continued to have fever, while in one case there was a lowering of the temperature in 24 hours, followed by another rise which continued until the death of the patient.

No work has as yet been reported concerning the use of sensitized vaccines in Malta fever. It would be unsafe to make a prediction concerning their value without trial. The successful use of sensitized vaccines in other infections as recorded by

Digitized by Google

Besredka,[35] Broughton-Alcock,[36] and Gordon,[37] would suggest that such a trial be made.

Attempt to Prepare an Anti-Melitensis Serum.

The possibility that larger doses of a more efficient serum might give better results than were obtained by the English observers, and the favorable reports of the use of the Trambusti-Donzello product, led us* to attempt the preparation of an anti-melitensis serum. A gelding, weighing 1200 pounds, which had been used previously for the preparation of diphtheria anti-toxin, was selected and is now under treatment. Three strains very kindly given us by Dr. Mohler are being used.

The first injection was given on April 8, 1913. The cultures are grown on horse-blood agar and are usually 24 hours old at the time of injection. In every case they have been washed at least twice in the centrifuge with saline solution to free them from traces of the culture medium, and killed by heat at 60° C. for one hour. All injections have been given intravenously. The amount injected each time has been rapidly increased until at present (8.5.13) the horse is receiving the growth from ten agar bottles. This amount, suspended, after washing, in 20 c. c. of saline (0.85%),when counted by Wright's method, contained 31,700 million cocci per c. c., which is still only a fraction of the amount used by Eyre. On blood agar there is a fair growth in 24 hours. Our thought in using cultures of this age is that we may avoid autolysis with resultant loss, upon washing, of some necessary constituent. Living cultures have not been used, at any time, nor is it our intention to use them. The serum from a bleeding taken on July 21, 1913, a little more than three months after treatment was started, shows an agglutination titre of 1:2000, and gives fixation of complement with a melitensis antigen. No animal experiments have as yet been made. The washing of bacteria to free them from traces of the culture medium on which they have been grown is a distinct advantage, since horses may be given very large doses intravenously without causing toxic or anaphylactic symptoms. Our ability to give the

*The Mulford Biological Laboratories, Glenolden, Pa.

Digitized by Google

horse these increased quantities permits us to hope that we may succeed in the preparation of a valuable serum.

General Review.

The above review of the literature does not at first glance give great encouragement for making further attempts in the serum therapy of undulant fever. This work, initiated by Wright and continued by the English Commission, has apparently been abandoned, but the Italians have stimulated a revival of interest in it, and although reports of their work so far available cannot be considered conclusive, they are nevertheless decidedly encouraging.

At the time of the English investigations opinion generally as to the value of anti-bacterial serums was unfavorable. Only within the last three or four years has this opinion begun to change. At that time the various anti-tubercle serums, the anti-streptococcus and anti-pneumococcus serums, anti-typhoid and anti-anthrax were all held by the majority of physicians to be worthless. Out of the chaos some of these products have emerged with the stamp of approval upon them, while the others have sunk even lower. To the list of those approved have been added several others, e. g., anti-meningitis and anti-gonococcus serums. This change in our attitude is due to several causes. In the first place we do not expect so much, and our laboratory tests are not so severe; we know more about the pathogenesis of the diseases in question and understand why a serum may be unable to exert any influence at one stage while it does at another; we have ceased to require the serum to act without the aid of any other therapeutic agent, and we are not greatly surprised if a patient in extremis is not rescued from death. Furthermore, larger doses are the rule and improvements in methods of treating the animals producing the serum have probably resulted in obtaining a more efficient product.

It is an axiom that each type of infection is governed by its own laws; in some the relation of the germ to the characteristic tissue changes is more important, from the standpoint of specific treatment, than are its specific poisons. Not only the toxic or metabolic products of the bacterium are to be considered,

Digitized by Google

but also its tendency to make for itself a *nidus*† in the tissues. The *M. melitensis* seems to have this tendency as a special characteristic and is therefore able to resist the anti-bacterial powers of the blood, even though raised by specific treatment. Whether or not this resistance does depend upon its ability to form foci in certain tissues in which it is protected, as streptococci are protected in the tonsils, or upon some power of readily becoming *serum-fast*,‡ is a question that needs solution. The fact that female goats so easily become carriers and are so little affected by vaccination gives weight to the nidus hypothesis. It will be remembered that while the English Commission was able to diminish greatly the number of micrococci in the milk, the germs were in no case entirely eradicated, and may not this mean that all free micrococci were destroyed while those ensconced in the tissues were unharmed and continued to grow? The fact that the number of cocci in the milk was so readily diminished, while not conclusive evidence, is an argument against serum-fastness. If further studies should show that the micrococcus makes carriers by nidus formation, the eradication of undulant fever by the vaccination of carrier-goats would be impossible, consequently vaccination of all uninfected animals, repeated two or three times a year during an intensive campaign, and destruction of all carriers would seem to be the only effective procedure.

With regard to the treatment of the disease in man, the accumulated experiences of the past decade in the use of bacterial vaccines in general prove conclusively that, properly used, suspensions of killed micrococci have distinct value. The question of the relation of the bacteria to the tissues is here again a most important problem. It is easy enough to make antibodies, but to induce the antibodies to perform their specific function is entirely a different matter. In cases of long standing it may be necessary to continue treatment for a considerable period. In

†Wright defines a Nidus as an area of lowered bacteriotropic pressure where micro-organisms are able to grow as a result of retarded replacement of antibacterial substance.

‡Ehrlich uses this word to describe strains of bacteria immune to their homologous anti-serum. For instance, a typhoid bacillus grown in anti-typhoid serum loses its agglutinability; that is, it becomes accustomed to the agglutinins in the serum and is no longer influenced by them.

Digitized by Google

such cases the pathologic condition with regard to its specific treatment approaches pulmonary tuberculosis, in which the greatest hope we can hold out to the patient is that his tolerance to products of the tubercle bacilli may be so increased that they will cause him no inconvenience.

There may be a distinct advantage in the use of sensitized vaccines for the treatment of persons of low vitality, or at a toxic period of the disease. It is said their administration is followed by no negative phase.

Bibliography.

1. Ferenbaugh. Endemic Mediterranean Fever (Malta Fever) in Southwest Texas. Jour. A. M. A., Aug. 26, 1911, Vol. 57, 9, pp. 730-731.

2. Gentry and Ferenbaugh. Endemic Malta (Mediterranean) Fever in Texas. Jour. A. M. A., Sept. 9, 1911, Vol. 57, 11, pp. 889-891. Endemic Malta (Mediterranean) Fever in Texas. Jour. A. M. A., Sept. 23, 1911, Vol. 57, 13, pp. 1045-1048. Malta Fever in Texas. Jour. A. M. A., Sept. 30, 1911, Vol. 57, 14, p. 1127.

3. Mohler and Hart. Malta Fever and the Maltese Goat Importation. Twenty-fifth Annual Report of the Bureau of Animal Industry, 1908, pp. 279-295.

4. Craig. International Clinics, 1905, p. 89.

5. Yount and Looney. Malta Fever in Arizona, with a Preliminary Report of Cases. Southern Calif. Pract., June, 1912, Vol. 27, 6, pp. 257-261.

6. Negre and Raynaud. Melitensis et Paramelitensis. Societe de Biol., 1912. 72, pp. 791-793.

7. Wright. On the Application of the Serum Test in the Differential Diagnosis of Typhoid and Malta Fever. The Lancet, 1897, Vol. 1 (March 6). Note on the Technique of Serum Diagnosis of Acute Specific Fevers. B. M. J., 1897, Vol. 1, p. 139. On the Employment of Dead Bacteria in the Serum Diagnosis of Typhoid and Malta Fever, Wright and Semple, B. M. J., 1897, Vol. 1, pp. 1214-1215.

8. Nicolle and Conor. Sur la Valeur du Serodiognostic de la Fievre Mediterraneenne. Arch. Inst. Pasteur, Tunis, 1912, 3, pp. 136-139.

9. Zammit. Report of the Commission for the Investigation of Mediterranean Fever, London, Harrison, 1905, Part VI, pp. 42-44.

10. Sicre. Sensibilisatrice Specifique dans les serums des animaux traites par le "M. Melitensis" et dans le serum des malades atteints de fievre mediterraneenne. Ann. de l'Inst. Pasteur, 1908, Vol. 22, pp. 616-623.

11. Mohler and Eichhorn. Contribution to the Diagnosis of Malta Fever. Jour. A. M. A., April 13, 1912, Vol. 58, 15, pp. 1107-1109.

12. Missiroli. La Fissazione del Complementa nella Febbre Mediterranea. Il Policlinico, Sez. medica, 1912, Sept., Vol. 19, 9, pp. 414-421. La Sieroterapia Nella Febbre Mediterranea. Riv. crit. di clin. med. 1911, XII, 769-777.

13. Aldridge. Note on the Serum Reaction of Mediterranean Fever and Its Treatment by Antitoxic Plasma. The Lancet, May 21, 1898, Vol. I, pp. 1394-1395.

14. Fitzgerald and Ewart. A Case of Malta Fever Treated with Malta Fever Antitoxin. The Lancet, April 15, 1899, Vol. 1, p. 1024.

15. Shaw. Immunity, Serum, Toxin and Vaccine Experiments on Monkeys with Regard to Mediterranean Fever. Reports of the Mediterranean Fever Commission, Part V, pp. 28-30.

16. Eyre. Report Upon the Bacteriological and Experimental Investigations During the Summer of 1906, Eyre, McNaught, Kennedy and Zammit. Reports of the Mediterranean Fever Commission. 1905, Part VI, Section VIII, pp. 42-44. Melitensis Septicemia. The Lancet, 1908, Vol. 1, pp. 1677-1682; 1747-1752; 1826-1832. Micrococcus Melitensis

Digitized by Google

and Anti-Serum. Reports of the Mediterranean Fever Commission, 1905, Part V, pp. 42-53. The Incidence of the Mediterranean Fever in Malta and Its Relation to the Size of the Goat Population. The Lancet, June 13, 1912, Vol. I, pp. 88-89.

17. Trambusti. Biochem. e Terap. Sper., 1910, Fasc. 6.

18. Morpurgo. Contribution to the Serum Therapy of Mediterranean Fever. Gaz. degli Ospedali e Delle Cliniche, Vol. 31, 7, Jan. 16, 1910, pp. 70-71. Due casi di febbre mediterranea curati col siero anti-melitense (Trambusti-Donzello). Riv. ospedaliera, 1912, Vol. 2, pp. 304-305.

19. Missiroli. Loc. cit.

20. Tomaselli. A case di febbre di Malta curato col siero Trambusti. Gaz. d. ospedali, Milano, 1912, XXXIII, pp. 457-458.

21. Morpurgo. Loc. cit.

22. Balduzzi. Serotherapy of Mediterranean Fevef. Gaz. d. osped. delle Clin., Jan. 2, 1912, Vol. 33, 1, pp. 2-4.

23. Natale. Contribution to the Therapy of Mediterranean Fever with the Serum Trambusti-Donzello. Il Policlinico, 1912, Vol. XIX, Sez. Pratica, 27, p. 983.

24. Birt and Lamb. Mediterranean or Malta Fever. The Lancet, 1899, Vol. 2, pp. 701-710.

25. Shaw. Loc. cit., pp. 33-36.

26. Eyre. Loc. cit.

27. Eyre, McNaught, Kennedy and Zammit. Report Upon the Bacteriological and Experimental Investigation During the Summer of 1906. Reports of the Mediterranean Fever Commission, 1905, Part VI, Section VIII, pp. 42-44.

28. Vincent and Collignon. Concerning the Active Immunization of Goat Against Malta Fever. C. r. Societe de Biol., 1910, Vol. 69, pp. 468-470.

29. Panto. Sulla immunizzazione attive della capre contro la febbre mediterranea. La Riforma Medica, 1912, Anno 28, N. 13, pp. 337-341.

30. Reid. Therapeutic Inoculations in Mediterranean Fever. Proc. of the Roy. Soc. of London, 1906, Vol. 57, pp. 463-470.

31. Basset-Smith. The Treatment of Mediterranean Fever by Means of Vaccines, with Illustrated Cases. Jour. of Hyg., 1907, Vol. VII, pp. 115-144.

32. Allen. Vaccine Therapy and Opsonic Index, 1910, 3d Ed., Phila., Blakiston, p. 256.

33. Wright. On the Foundations of Serum Therapy. The Clinical Journal, May 16, 1906.

34. Brancati. The Wellcome Vaccine in Mediterranean Fever. Il Policlinico, Sez. Pratica, 1912, Vol. 19, 46, pp. 1676-1677.

35. Besredka. C. r. Acad. de Sci., 1902, Vol. CXXXIV, p. 1330. De l'Immunisation Active contre la Peste le Cholera et l'Infection Typhique, Ann. de l'Inst. Pasteur, 1902, Vol. 16, pp. 918-930. De la Vaccination par les Sensibilises, Bull. de l'Inst. Pasteur, 1910, Vol. 8, pp. 241-253. Bull. de l'Inst. Pasteur, 1912, 12, pp. 529-540. Des Virus-Vaccins Sensibilises. Biologica, 1912, Vol. 2, 24, pp. 353-356.

36. Broughton-Alcock. Vaccination for Typhoid Fever by Living Sensibilised Bacilli Typhosi. The Lancet, 1912, Vol. 2, pp. 504-508.

37. Gordon. Sensitized Vaccines in Acute Bacterial Infections. The Lancet, June 28, 1913, p. 1796.

Digitized by Google

CULTIVATION OF MALARIAL PLASMODIA (PLASMODIUM FALCIPARUM) IN VITRO IN THE BLOOD OF A DIABETIC WITHOUT THE ADDITION OF DEXTROSE.

By
CHARLES C. BASS, M. D.,
and
FOSTER M. JOHNS, M. D.,
New Orleans.

With Clinical Notes on the Case by I. I. LEMANN, M. D., New Orleans.

In a former publication we[1] have called attention to the fact that in order to cultivate the asexual cycle of malarial plasmodia *in vitro* it is necessary to add to the culture material a certain amount of dextrose. About one-half of one per cent. has seemed to us to be most favorable. Upon the addition of this amount of dextrose, one or more generations of asexual parasites may be grown in normal blood or in blood from a malarial patient. Without the addition of dextrose all asexual parasites in blood *in vitro* die within a few hours. Other workers[2 3 4 5 6] have been able to cultivate malarial plasmodia by following our technic, including always the use of dextrine in the culture material. In fact, Ziemann believes that a larger amount than one-half of one per cent. of dextrose gives better results.

In our early paper we[1] expressed the opinion that it was quite probable that the other red blood cell parasites of man and animals could be cultivated with the technic we had devised after such modification as might be necessary to suit the particular parasite. With slight modification, Ziemann[5] has cultivated *Pyroplasma canis*, a red blood cell parasite of dogs. In the course of cultural experiments with *Trypanosoma americanum* we[8] have observed growth of *Pyroplasma bigeminum* in tubes to which dextrose had been added.

Dextrose, therefore, appears to play an important part in the cultivation of red blood cell parasites *in vitro*. The great influence of dextrose on the growth of malarial plasmodia *in vitro*

Digitized by Google

suggests the idea that it may also influence the life of the parasite *in vivo*. We have suggested the possibility that certain influences, such as diet, exertion, disease, etc., which cause variation in the dextrose content of the blood, may be important factors in determining the clinical course of malaria.

In view of the possible importance of this phase of the subject and of the striking result obtained, we thought the following observation worth recording.

Through the kindness of Dr. I. I. Lemann, we obtained blood from a patient who had had glycosuria for about three years, and who had had malarial fever seventeen days. Urine contained sugar on this day. The patient had taken quinine irregularly since the first day of fever. He had temperature 102° F. to-day. A stained specimen of blood showed a few ring form parasites and a very few crescents and ovoids. Twenty c. c. of blood were drawn from the median basilic vein. To 10 c. c. of the blood 0.1 c. c. of a 50% solution of dextrose was added. To the other 10 c. c. no dextrose was added. Each was defibrinated by stirring with a glass rod, as we usually do for malaria cultures.

The blood was placed in tubes about 1.25 cm. in diameter, each containing a column about 2.5 c. m. deep. These were incubated at 37° C.

Examination at frequent intervals of samples from each set of tubes showed the schizonts to be growing in each, and as well in one as in the other. They developed to beautiful rosettes in about 30 hours, when the culture was used for another experiment and this experiment discontinued. In the last preparations made from the cultures without added dextrose, no dead parasites could be found. This is in striking contrast to what occurs when non-diabetic blood is employed for culture material without added dextrose. No parasites grow. All die in a few hours. The only exception is the instance of blood drawn following a heavy carbohydrate meal or following violent exertion, either of which increases the dextrose content of the blood. (This patient had taken only light diet and was in bed.) In such, blood parasites may sometimes be cultivated without the addition of dextrose.

Digitized by Google

This observation indicates that whatever influence dextrose has on cultures of malarial plasmodia and which seems to be essential for their cultivation *in vitro* may also be produced by the blood sugar of diabetes.

It remains to be determined, however, whether an increase in the dextrose content of the blood favors the growth of malarial plasmodia *in vivo*. The quinine the patient had taken in this instance does not permit definite conclusions to be drawn, as is indicated by the following clinical report by Dr. Lemann:

Clinical Note on the Above Case of Malaria in a Diabetic.

By I. I. LEMANN, M. D., New Orleans.

Mr. L., age 48, has a negative history, in so far as it concerns the present consideration, until about three years ago. He was then troubled with boils, his urine contained sugar, and a diagnosis of diabetes mellitus was made. He has been examined from time to time, and regardless of irregular and indefinite dieting he has continued to have some sugar in his urine.

On July 15, while in Central America, patient took fever, which was diagnosed malaria. He began taking quinine the next day and took it irregularly, from five to thirty grains a day, until seen by me July 29th. He left off the quinine altogether during two or three days of this time. He had fever on several days regardless of the quinine. In fact, there is doubt as to whether he was free from fever during any 48-hour period. Patient had remittent type of fever as high as 103 1/2° F. for three days. Estivo-autumnal, "rings, crescents and ovoids," were found and the urine showed 3 per cent sugar.

August 1st, ordered quinine sulphate, five grains every four hours, continued for eight days. During this time fever continued with intermissions. A few parasites present.

August 9th, ordered quinine sulphate, ten grains every morning for eight days. By this time the patient had no fever and no parasites could be found.

August 17th, ordered quinine sulphate, five grains every morning. No return of fever to date, September 3d.

The fever and malarial plasmodia persisted in this case in

Digitized by Google

spite of sufficient quinine to control the usual case of malaria. The indications are that this may have been influenced by the presence of an increased amount of dextrose in the blood stream.

References.

1. Bass, C. C., and Johns, Foster M. Jour. Exp. Med., Vol. XVI, No. 4, 1912.

2. Lavinder, C. H. Jour. American Med. Assn., Vol. LX, No. 1, 1913.

3. Thomson, J. G., and McLellan, S. W. (with a note by Ronald Ross.) Ann. of Trop. Med. and Hyg., Vol. VI, No. 4, 1912.

4. Thomson, J. G., and Thomson, D. Ann. of Trop. Med. and Par., Vol. VII, March, 1913, pp. 153-164.

5. Ziemann, H. Zentralbl. f. Bakt. Originale, 1913, Bd. 67.

6. Ziemann, H. Dtsch. Med. Wochenschr., 1913, Nr. 6.

7. Ziemann, H. Arch. f. Schiffs u. Trop. Hyg., Bd. 17, 1913.

8. Cited by Bass, C. C., in manuscript submitted to the Permanent Commission of the International Congress of Medicine.

Digitized by Google

TRANSACTIONS OF THE AMERICAN SOCIETY OF TROPICAL MEDICINE

Tenth Annual Meeting, Held at Washington, D. C., May 6, 7 and 8, 1913.

At this meeting of the Society Dr. J. M. Anders read the following eloquent eulogy on the late Dr. Roland G. Curtin.

A BIOGRAPHICAL SKETCH OF ROLAND GIDEON CURTIN, M. D.,

Ex-President of the American Society of Tropical Medicine.

By J. M. Anders, M. D., Professor of Medicine in the Medico-Chirurgical College of Philadelphia.

Roland G. Curtin, A. M., M. D., Ph. D., the subject of this memoir, was born at Bellefonte, Pennsylvania, October 28, 1839. His father was Dr. Constans Curtin, born in Ireland, but graduated with the class of 1809, University of Pennsylvania, and his mother was Mary Anne Kinne of Connecticut. At the age of sixteen he entered Williston Seminary of Easthampton, Mass., from whence he was graduated in 1859.

Dr. Curtin received his degree in medicine with the class of 1866, University of Pennsylvania, and then was chosen and served as resident physician in the Philadelphia Hospital for the ensuing two years, after which he visited the European universities. On returning home he settled in Philadelphia, where he practiced his profession until within a short time of his death, continuing his labors even after partly disabled by a lingering and fatal illness.

In 1871 the degree of Doctor of Philosophy was conferred upon Dr. Curtin by the University of Pennsylvania, and in 1883 he received the degree of Master of Arts from Lafayette College.

Early in his career (from 1871 to 1873) Dr. Curtin was professor of geology and mineralogy at the Wagner Free Institute of Science. He was more or less actively associated with the Philadelphia Lying-in, Charity, University, Presbyterian, Howard, Douglas, Rush and St. Timothy Hospitals. His services to the University and the out-patient department of the University Hospital, both as physician and teacher, was a long and useful one. He was a member of the visiting medical staff of the Philadelphia Hospital for many years, and from 1890 until his demise was president of its Medical Board. Surely his name will long be connected with the University and the Philadelphia hospitals, with which well-known institution his wide reputation is closely identified.

In the unseemly rush for preferment, place, or power, Dr. Curtin was ever conspicuous by an opposite tendency. He was, however,

Digitized by Google

honored by being elected to membership in, and to the presidency, as well as other official positions, of numerous local and national organizations, both medical and non-medical, as will appear evident hereafter.

Dr. Curtin was assistant medical director of the Centennial Exhibition of 1876, and a member of the Committee of Arrangements of the National Medical Congress which met in Philadelphia in that year. In 1887 he was an honorary vice president of the Section on Climatology and Demography of the National Medical Congress, Washington, D. C. In 1893, at the World's Congress, auxiliary to the Columbian Exhibition at Chicago, Dr. Curtin delivered the address of welcome to the foreign delegates, and was honorary president of the Medico-Climatologcial Division of the Congress. At each of the First, Second and Third Pan-American Medical Congresses, held in 1893, 1896, and 1901, respectively, Dr. Curtin held membership. In 1895 he was a delegate from the American Medical Association to the British Medical Association, which met in London.

Dr. Curtin was a member of many scientific societies, among which may be mentioned the Philadelphia County Medical Society, the American Medical Association, the American Academy of Medicine, the Philadelphia Obstetrical and Pathological Societies, the College of Physicians, a founder of the American Anthropological Society, and many others. He was one of the founders, and an interested member, of the American Climatological Association, and soon not only became a frequent contributor to its Transactions, but also one of the leading spirits in the conduct of its affairs, and in the determination of its policy. He was also one of the founders of the Alpha Mu Pi Omega Medical Fraternity, and the founder, as well as president, of its Grand Chapter.

Dr. Curtin devoted much energy and attention to the promotion of feelings of fraternal respect and love among medical men, and also between physicians and undergraduates in his long and intimate association with the fraternity above mentioned. In his view, the medical profession was a true brotherhood, and he took occasion constantly to bring into brotherly sympathy the members of our guild, and were the example he left to his survivors—to us—in this regard universally followed, who can tell with what terms of respect each would speak of the other, and how much greater our influence as a grand professional confederacy?

Dr. Curtin held membership in the Sons of the American Revolution, the Grand Army of the Republic, the American Social Science Association, the Pennsylvania Forestry Association, the Fairmount Part Art Association, the Pennsylvania Irish Society, and was a life member of the Academy of Natural Sciences of Philadelphia. He was for a number of years a member of the Council of the New England Society of Pennsylvania, of which he had also been the President; he was a past master of the Masonic Fraternity, a Knight Templar, and a member of the Scottish Rite, thirty-second degree.

Digitized by Google

Dr. Curtin was elevated to the presidency of the following important and well-known bodies: The Philadelphia County Medical Society, the American Climatological Association, the American Society of Tropical Medicine, the Philadelphia Medical Club, the Aid Association of the Philadelphia County Medical Society, the Alumni Association of the Auxiliary Department of Medicine of the University of Pennsylvania, and of the Alumni Association of the Philadelphia Graduates of the Medical Department. For a considerable period of time he had been historian of the Alumni Society of the Medical Department, a position to which he devoted time and energy without stint. Dr. Curtin was a member of the Board of Directors of the General Alumni Society since 1900, and, as has been well said by the secretary, Mr. H. M. Lippincott, "none was more attentive to his duties than he." Within a month of his passing away, the Philadelphia Alumni Society of the Medical Department of the University adopted a resolution having for its purpose the creation of a "Roland G. Curtin Alumni Scholarship for the Sons of Physicians" (desirous of studying medicine), and a committee was appointed to raise the necessary funds. On learning of this action by his fellow-members Dr. Curtin was deeply moved, and keenly appreciative of an honor which is truly unique in medical circles. There were many other positions of influence and trust to which he was called, and it may in truth be added that in all his official and fraternal relations Dr. Curtin never knowingly violated his sense of duty nor surrendered his convictions of right.

Dr. Curtin's contributions to medical literature were numerous and embraced a wide range of topics, though chiefly in the line of diagnosis and treatment of medical affections. His writings are noted for their simplicity of style, clearness and directness; they have been eagerly read, and widely quoted in literature. Dr. Curtin's extensive experience, which he was ever competent to utilize, gave personal value to the opinions modestly expressed in his many articles.

Although practicing general medicine, Dr. Curtin early, and throughout his long career, manifested a strong predilection for internal medicine. His own resources in the line of practical medicine, upon which he drew constantly, were truly extraordinary. Those who attended his clinics and listened to his *viva voce* expositions, may have found him less facile in speech than some of his colleagues, but could not fail of being impressed with the breadth, perspicuity and profundity of his medical knowledge. His lectures were noteworthy for their conciseness and directness, and also for the safety and soundness of their substance.

Dr. Curtin was easily one of the leading physicians of his day and generation. He enjoyed the well-deserved reputation of being an unusually skillful diagnostician, possessing to a high degree the co-called "clinical instinct." He may in this respect aptly be compared with the late Dr. Agnew, who also possessed the power of arriving at a certain diagnosis in atypical, irregular and obscure forms of disease, apparently

Digitized by Google

without making a close study or thorough examination of such cases. Such men obviously manifest superior mental endowments in general, backed by cool judgment.

Dr. Curtin was highly successful as a general practitioner, and in his prime enjoyed an extensive clientele, while later in life his maturer judgment, ripe experience, and noble personal qualities, made him especially attractive to many physicians as a consultant. In that difficult capacity Dr. Curtin could always be trusted, and his advice and services were most valuable. He was never guilty of the "wise look," or "significant shrug of the shoulder," intended to prejudice the patient against the family physician, whose diagnosis and treatment he invariably endorsed, whenever possible without violence to his better judgment and conscience. Dr. Curtin was widely known as the doctor's doctor. This fact would of itself establish his claims to distinction, for it may be taken as a criterion of his standing and reputation as a physician in the professional eye.

We are apt to dwell on Dr. Curtin's ability as a diagnostician, thus overlooking the fact that he also should be numbered among the greatest of therapeutists. As all know, the majority of general practitioners have special formulae for the different diseases to which the human family is heir, but Dr. Curtin, while never advocating his special formulae for special diseases, yet employed such with splendid success for certain well-defined indications or conditions. But it was only to be expected that a man of his clearness of intellect, enormous experience and sound judgment should be able to discriminate in favor of reliable medicaments, and combinations of remedial agents. Dr. Curtin's temperament and imagination led him to sympathize with the past in medicine, particularly as regards therapeutics, so that he combined the practical services of his own with that of former generations.

It should be pointed out here that Dr. Curtin showed no preference for patients because of their wealth or station in life. It is not adding one syllable more than I believe to state that his services were rendered as cheerfully and as faithfully to the poor as to the rich. Indeed, he has been known to go to an outlying district of Philadelphia to minister to a poor patient while wealthier ones, and those higher in the social scale, were obliged to wait.

He thus combined industry and fidelity to duty with personal sacrifice in the discharge of his professional labors—in truth, combined professional with angelistic work. His great heart went out to suffering humanity, to the afflicted poor in particular, just as it constantly went out to young and struggling members of the medical profession, whom he cheerfully served at all times. I have most probably emphasized sufficiently his abilities both as a diagnostician and therapeutician, but I shall not pretend to do justice to his fine, lofty character in the brief space at my disposal. In my belief, it will be Dr. Curtin's high char-

Digitized by Google

acter that will write his name indelibly in the pages of history; it will be Curtin, the man of character, that will live without perishing and serve as a guiding star to succeeding generations of the medical profession. As in other walks of life, so in the medical profession, no man rises far above the common level if he does not possess an unsullied character.

He continued to delve away at his studies and organizations in which he was deeply interested, e. g., the Aid Association of the Philadelphia County Medical Society, and the Medical Alumni Society of his Alma Mater, so long as strength sufficient endured. Within ten days of the occurrence of his sad death, he showed to me a letter in response to one which he had written to a physician living in Maryland; it bore upon the question of the founding of a Home for Physicians in this city—a contemplated benevolent institution which he originally suggested.

Our deceased brother took high rank in the profession; he shone out not so much as a scientific investigator, though capable of original thought, as a diagnostician and therapeutician, and a man of lofty character, as well as helpful, generous feeling, amounting to rare genius.

What has been written by me in the memoir of another prominent member of the medical profession applies with peculiar fitness to Dr. Curtin, to wit: "There are few members of our profession to whom nature has been so kind as she was to Dr. Curtin, whom she generously endowed with the most attractive and striking personal characteristics. More than six feet tall, with regular features, his presence was both noble and distinguished; his manners were unassuming, but courteous, while his aversion to pomp and pretense was well known. Wholly unselfish and genially disposed, he enlivened and cheered all with whom he came in contact, and in an especial degree contributed to the comfort, support, and fortitude of his less fortunate professional brethren."

It was the writer's good fortune to see him at intervals during his last protracted illness, and he was much impressed with certain rare features of his lofty character. The basic-stratum of the peculiar qualities impressed by nature was easily a deep sense of responsibility to God, and this, like a holy ark, kept him safe amid the rising flood of temptations, skepticism and intrigue that tends to engulf every professional life of mark.

No false steps to be retrieved, nothing realized that had not been previously conceived with care and caution, he marched under the escort of the god of fortune, his reputation unmarred by the shadow of the smallest cloud on his integrity.

On March 21, 1882, he married Julia Robinson, *nee* Taylor, daughter of the late Edwin Taylor of Hartford, Connecticut, a union blessed by two children, Roland Gideon, Jr. (deceased), and Mary Constance Curtin.

It is deservedly noteworthy that Dr. Curtin died on March 14th,

Digitized by Google

the forty-seventh anniversary of his graduation in medicine, and seven years to the day after the first of a series of attacks of recurrent pulmonary edema, which culminated in his last fatal illness. He was buried on the ninth anniversary of Mrs. Curtin's death, for him the saddest day of the year during the declining period of his life. He was buried on St. Patrick's Day of the present year, which day he had always spent reminiscing of his father and Ireland.

Such was the strange coincidence of events that closed the life of one possessing the most tender susceptibilities, and one whose death was a calamity to the profession of which he was a chief ornament.

"None knew him but to love him,
None named him but to praise."

Digitized by Google

CURRENT LITERATURE

Diagnosis and Treatment of Dysenteric Abscess of the Liver.—(In the Archiv für Schiffs und Tropen-Hygiene, Hefte 9 and 10, 1913.) Dr. O. Müller of Hong Kong contributes a valuable article on hepatic abscess of dysenteric origin. He rejects the term "tropical abscess of the liver," and uses instead the designation "dysenteric abscess," which really has a more definite meaning than the other. Dr. Müller is a clinician of the old school and is at the same time an adept in modern laboratory methods. In making his diagnosis, he relies chiefly on his clinical skill. In his treatment he has devised a method of evacuating the hepatic abscess, which he claims to be superior to Manson's method, in that all the steps of his operation are performed in full view of the surgeon, whereas in the Manson operation the surgeon works in the dark and is never certain of what he is doing. When a diagnosis of hepatic abscess is clearly made, of course steps should be taken to remove the pus. Müller has tried all methods, and has evolved a technic all his own. When, by aspirating in one of the three axillary lines in the eighth intercostal space—the point of predilection—he has found pus, the needle is withdrawn, and an incision 12 centimeters long is made along the upper border of the ninth rib, and curved upward at each end so as to make a single flap. The soft tissues are dissected upward and downward, so that the eighth and ninth ribs are freely exposed in the wound. Both ribs are resected for about 8 or 10 centimeters. Then the intervening intercostal muscles and blood vessels are raised from their bed, ligated with strong catgut, and then resected to the same extent as the ribs. In cases where no pleuritic adhesions have formed, the pleura can now be seen moving in respiration. Now the assistant presses with his fingertips the pleural walls together—costal pleura against diaphragmatic pleura—and in this way pneumo-thorax is prevented. An incision two centimeters long is now made through the pleura costalis, parallel with the ribs, and passing the point of exploratory puncture. The incision in the costal pleura is now enlarged, and the diaphragm is incised in the same direction until the glossy surface of the liver comes into view. He then clamps the costal pleura to the cut diaphragm at both ends with a Mickulicz peritoneal clamp and sutures the costal pleura to the edge of the wound in the diaphragm with a continuous suture. The air is thus permanently kept out of the thorax. The liver then lies freely exposed to view and another exploratory puncture will give a more accurate idea of the depth and size of the abscess. The operator can ascertain how much hepatic tissue must be traversed before reaching the abscess. When the pus lies only one or two centimeters from the surface,

Digitized by Google

Müller plugs the abdominal cavity with a long strip of gauze firmly around the opening, then cuts through the peritoneal covering, opens the abscess widely with the divulsing forceps (Kornzange), and inserts a rubber drainage tube. When the abscess is deeper, Müller inserts a thick metallic trocar (with a diameter of one centimeter), marked off on the outside into centimeters, as deeply as where the exploring needle revealed pus; then he drives it in one centimeter further, and the stylet is withdrawn, and the pus flows freely from the trocar. The trocar is made of nickel-plated steel. The point and edges are blunt, since his instrument, contrary to Manson's, passes through soft liver-tissue only. Müller has never set up a hemorrhage with his instrument, though he has done so with Manson's. A sliding, adjustable shield, passing over the canula, is screwed to the latter after the wound is tampooned, and after the soft tissues are approximated with catgut. The trocar is fastened with two cross-pieces of adhesive plaster, to prevent slipping. Müller claims that his method has the great advantage of being always in full view, and not in the dark; that it does not cause hemorrhage, such as follows the use of the knife; and that infection of the wound and neighboring tissues is prevented by the firm pressure exerted by the canula on the surrounding structures. Furthermore, pure amoeba pus is not infectious. In cases in which pus escaped into the peritoneal cavity, no symptoms of peritonitis developed. This innocuousness of the amoebic pus is well illustrated in the Manson operation, in which a rubber drainage tube, smeared with the pus, traverses the pleural cavity without causing any complications. The metal canula is removed after five days, and a rubber tube replaces it. The dressing is applied more loosely. When the abscess has already burst into the peritoneum, the opening must be greatly enlarged to provide free drainage. It is unnecessary to curette the abscess cavity, and it is dangerous on account of possible hemorrhage. Müller's experience has shown him that simple opening of the abscess effects a cure. Aspirating appliances are unnecessary. When the pus is very thick and tough, he irrigates, after the fifth day, through the drainage tube with a one-half per cent solution of quinine. When the fever persists even after opening of the abscess, and the Schlesinger is strongly positively, and, in brief, the patient does not improve, we must look for a second abscess, or a multiple abscess, or a systemic infection. The occurrence of a copious dysenteric diarrhea indicates sepsis, and is an ill omen. Anyone with a good nose can easily distinguish a septic patient. Müller has had four cases of double abscess. Two of them died—one of them with multiple abscess.

McShane.

Tardy Appearance of Abscess of the Liver Following Dysentery. (Journal de Medicine et de Chirurgie pratiques. 10 Juin, 1913, p. 424.) René Leriche wrote his thesis on this subject, to show that many years

Digitized by Google

may elapse between the onset of amoebic infection and the recognition of an abscess of the liver. It is hard to explain the long tolerance and latency or the markedly slow development of the abscess in patients who have had dysentery many years before. Two hypotheses may be entertained: First, the abscess existed early and caused no trouble, either from the absence of reaction on the part of the liver, or for any other reason. Second, more likely, the abscess developed late. The amoebic nodule without pus became encysted and has undergone slow resorption. Then, perhaps, sudden climatic changes, trauma, alcoholic excesses, an infectious disease, may bring about the formation of an abscess of the liver in individuals who had had dysentery many years before in the Tropics and who had been repatriated many years since. As a matter of fact, statistics show that the intervals may be of 5, 7, 9, 11 and 13 years. During this long period elapsing between the initial dysentery contracted in the Tropics and the appearance of the abscess of the liver, the patient may present no local or general reaction at all. At other times the patient may show intermittent paroxysms of various kinds, but with no characteristic indications. It is therefore pretty difficult to recognize the true condition, if the previous history is overlooked. At any rate, as soon as the diagnosis is made, surgical intervention is, at once, necessary, followed by a course of emetine by needle, which has already given so many good results.

Dupaquier.

Experimental Pellagra in a Monkey.—(Journal American Medical Association, lx, 25, June 21, 1913, p. 1948.) W. H. Harris reports that he has succeeded in producing pellagra in the monkey (*Macacus rhesus*) by injecting the animal with a Berkefeld filtrate from the lesions of fatal cases of pellagra. Tissues of the different parts of the central nervous system, portions of the skin lesions and of the alimentary tract, including the nasopharyngeal mucous membrane, were mixed with normal saline solution, ground in a mortar, passed through a Berkefeld N candle and injected subcutaneously, intravenously, and intraeranially in large quantities. The incubation period seems to be several months. The symptoms and lesions were perfectly typical of pellagra. The author concludes as follows: "These experiments would indicate that pellagra may be transmitted to the monkey (*Macacus rhesus*) by means of a Berkefeld filtrate derived from the tissue of the human subject; at least, the animals develop all the essential clinical signs and symptoms, together with the pathologic picture discerned in the disease in man. Furthermore, they suggest that the etiology of pellagra is a filterable virus or a micro-organism capable of passing through the pores of certain Berkefeld filters." C. W.

Quinine in Hemoglobinuric Fever.—(Therapeutic Gazette, June, 1913, p. 421.) Edgar M. Long expresses the belief that if quinine can

Digitized by Google

be given from the very first, before the blood-making centers have become partially exhausted and before the patient's vital resistance is worn out by prolonged toxemia, and if the patient is strong enough to live through the crisis which is absolutely certain to follow its administration, the drug can be given with probably a more rapid recovery than if it be withheld. Cases for quinine treatment should be carefully selected and the question carefully considered whether their resistance, or what is left of it, is strong enough to stand the quinine crisis. By far the best method of treatment is eliminative: diuresis, purgation, diaphoresis. The byword of the older practitioners, "keep his kidneys going and he will live," holds just as good to-day as it ever has, barring, of course, complications to which the patient is exceedingly prone. E. M. D.

Splenic Abscess in Malarial Cachexia.—(Lancet, April 26, 1913, p. 1162.) With the announcement that he has been impressed by the frequent occurrence of splenic abscess in cases of so-called malarial cachexia and by the disappearance of the cachexia on treatment of the local condition, F. E. Wilson reviews in a brief note the essentials of such cases coming under his observation while in Persia. In the diagnosis of such conditions, particular stress is laid on the continued fever, in spite of full quinine therapy, local signs of softening, pain or adherence of the spleen to the abdominal walls, and, last but not least, a marked leucocytosis. Surgical intervention in three cases resulted as follows: 2 recoveries, 1 death. From one case 1½ pints of pus were removed, in the other 1¼. The pus was full of bacteria, but absolutely free from malarial organisms. H. D. K.

Metabolism in Pellagra.—(American Journal of Medical Sciences, cxlv, 5, 1913, p. 625.) A series of fifteen experiments conducted by V. C. Myers and M. S. Fine show that the ability of pellagrins to utilize different foodstuffs appears to be only slightly if at all below normal. The elimination of the mineral and nitrogenous constituents of the urine is such as would be expected in pellagrous subjects. The presence of creatin in the urine, together with low creatinin coefficients offers sufficient evidence as to a general lowered physiologic tone. That renal irritation is a picture in many of these cases is manifest from the fact that in about 45% of the cases hyaline casts were found. Eight of the fourteen cases showed anacidity; this condition is usually associated with an entire absence of pepsin, or with very small amounts of pepsin. Pellagrins suffer from a marked indicanuria, which is excessive in those subjects suffering from gastric feebleness. While the ethereal sulphates do not parallel the indoxyl-potassium sulphate, the amounts excreted are greater where anacidity exists; and, they also maintain a higher ratio to the inorganic sulphates. Abnormal amounts of indol and skatol are present in the feces. The marked indicanuria,

Digitized by Google

the high elimination of ethereal sulphates, the abnormal amounts of indol and skatol, point to unusual bacterial activity in the intestine; this putrefactive process takes place in the upper part of the intestine.

H. D. K.

Beri-Beri in East Africa.—(Colonial Reports, November 20, 1912.) C. L. Chevallier reports quite a severe epidemic of beri-beri at Serenli, East Africa. The number of cases was 112, with a death toll of 44. In order to prevent the further spread of the disease, rice was excluded from the dietary of all those within range of the epidemic, but, despite this, cases continued to be noted, even many months after this change had been made in the dietary. The author, after reviewing the essential features of the epidemic, believes the disease is in all probability of germ causation. Heat, damp and overcrowding must be considered as predisposing elements in the spread of the disease, in the opinion of Chevallier.

H. D. K.

Digitized by Google

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed

The Care of the Body. By R. S. Woodworth, Professor in Columbia University. New York: Macmillan, 1912, pp. viii + 359.

The present is a popular work on personal hygiene. Considerable good advice is presented in its pages in a clear and interesting manner. Such books are always valuable as aiding in the education of the general public, without whose intelligent interest little can be accomplished in hygienic progress. The index is not adequate. C. W.

Care and Treatment of European Children in the Tropics. By Montagu Hartson. Cloth. Price, 7s 6d net. Pp. xvi + 226. London: Bailliére, Tindall & Cox. 1912.

This volume on diseases of children in the Tropics does, indeed, fill a gap in our literature of tropical diseases. The opening chapters deal with the general management and hygiene of infants and young children in the Tropics. The author dwells with special force on the necessity of a routine examination of the blood and feces of all children residing in warm climates. The chapter on malaria is very interesting, particularly that portion in which is explained the varying symptomology of the disease in children, and the rules laid down for treatment. A careful perusal of the book shows that the author, unfortunately, is very set, and, in some instances, ancient in his views of treatment. The chapter on cholera does not good deep enough into the technique of the intravenous treatment of cholera. Most startling of all is the declaration of the writer as regards ipecacuanha in amoebic dysentery. Ipecac is only employed when all other remedial agents have proved of no avail. The method of taking blood from typhoidal and other cases for examination, as recommended by Harston, is very crude. One of the most redeeming features of the book is the chapter on worms, which is well illustrated by beautiful micro-photographs. Aside from the points criticized, the book is a good one, and the reviewer believes it should be in the hands of every practitioner who treats children in the Tropics. H. D. K.

Mitzmain, M. Bruin. Bionomics of *Stomoxys calcitrans* Linnaeus: a Preliminary Account. Reprinted from the Philippine Journal of Science, vol. viii, No. 1, Sec. B, Tropical Medicine, February, 1913.

This is a well-written paper embodying a good amount of valuable and interesting information. The fly was found to begin egg-laying at

Digitized by Google

9 days of age and may lay as many as 20 times, and several hundred eggs at a time. The eggs hatch after 20-26 hours, and the larval stage lasts from 7 to 8 days. The pupal stage is generally 5 days in length. The female may live 72 days and the male 94 days. C. W.

Public School Alliance of New Orleans. Exceptional Children in the Public Schools of New Orleans. March, 1913.

This interesting report covers the results obtained in a preliminary study of the exceptional school children of New Orleans. Suggestions for further work and study are also included. The accuracy of the servey is probably great, as the results attained correspond very closely with those secured in other cities, e. g., the percentage of feeble-minded children is given at 0.28%, which is exactly the figure ascertained in a survey of the public schools of Philadelphia. C. W.

Stiles, Ch. Wardell. Soil Pollution. Reprint No. 127 from the Public Health Reports.

Terrible descriptions are given of the insanitary conditions allowed in certain convict camps. C. W.

Sutton, Richard L. Possible Inter-relationship of Infectious Eczematoid Dermatitis, Dermatitis Repens and Acro-Dermatitis Perstans. Reprinted from the Missouri State Medical Association, February, 1913.

War Department: Office of the Surgeon General. Photomicrographs of Spirochetae, Entamoebae, Plasmodia, Trypanosomes, Leishmania, Negri Bodies and Parasitic Helminths. Washington: Government Printing Office, 1913. Bulletin No. 1.

This is an entirely admirable collection of seventeen beautifully executed plates of the greatest teaching value. The text by Craig, Nicholls and Russell is clear, accurate and concise. The interest and attractiveness of the work can hardly be overstated. C. W.

Martin, E. H. Specific Treatment of Pellagra: Relative Value of Sodium Arsenilate and Salvarsan. Reprinted from the New York Medical Journal for March 15, 1913.

Fox, George Henry. Classification and Nomenclature of Acquired Cutaneous Diseases, including Syphilis. April, 1913.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CREIGHTON WELLMAN, M. D. ..... EDITOR-IN-CHIEF
CHARLES CHASSAIGNAC, M. D. }
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine } *Ex officio.*
JOHN M. SWAN, M. D., Secretary, American Society of Tropical Medicine }
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M. D., University of Pennsylvania.
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. OCTOBER, 1913 NO. 4.

EDITORIAL

Cholera: the Aftermath of the Balkan War.—The news that cholera has spread beyond the borders of the Balkans and has appeared in Hungary confirms the long-standing fears of sanitarians. When the disease first appeared in Sofia,[1] bacteriologists were hurried from Weichselbaum's laboratory and 120 cases were fully examined bacteriologically. To the heroic and admirable efforts of Kraus[2] and his associates may be attributed much of the credit for the control of the disease among the Balkan troops. Laboratories were established, pure water supplies provided, suspicious cases examined bacteriologically and vaccination widely practiced. Until recently the measures in force have sufficed to prevent the wide spread of the disease, and at this writing stringent regulations are being enforced to stamp out the threatened Hungarian epidemic. Germany and other European nations are

1. Wien. Klin. Woch., March 6, 1913, p. 366 f.
2. Wien. Klin. Woch., February 13, 1913, p. 241 f.

Digitized by Google

already beginning precautions looking toward the prevention of invasion of their territory by the disease. The recent existence of the disease in Tunis,[3] Constantinople,[4] India[5] and the Far East[6] and China[7] and other parts of the Tropics and Sub-tropics, to say nothing of its threatened and even actual entrance into Europe and the United States, render the fear of cholera epidemic no idle one. We may hope that the interest and intelligent activity of the various governments concerned will result in keeping the temperate world from the clutches of the disease.

Creighton Wellman.

Sanitation and Tropical Agriculture.—The study of tropical medicine and hygiene from the point of view of scientific research or general medicine is often referred to by writers. Tropical medicine and sanitation from the viewpoint of the business man is not often mentioned. The writer has just returned from a two months' voyage to Central and South America, in the course of which journey all the countries in which the United Fruit Company operates were visited. The results obtained in Tropical America by the medical department of this corporation form an impressive object lesson of the practical value of scientific tropical medicine. While the research and discoveries of the Director and his staff are not inconsiderable, yet the company's medical department is imbued with the practical, solid view that modern hospitals, good laboratories, skilled medical attention, trained nurses, drainage, pure water, protection against insects and the myriad other factors making up the department's activities, are "good business." These measures make for efficiency of workmen and administrators, which

3. Arch. de l'Inst. Past., Tunis, 1912, p. 144.
4. Gaz. des Hôp. Civils et Militaires, January 21, 1913, p. 117.
5. Indian Med. Gaz., January, 1913, p. 8.
6. Geneesk. Tijd. v. Nederl.-Ind., 1913, p. 13.
7. U. S. Naval Med. Bull., April, 1913, p. 251.

Digitized by Google

means cheap production of fruit and consequent increased dividends. The attitude of the president and directors of the company in accepting this doctrine and heartily supporting their medical department and its policies is not only a satisfactory and encouraging indication of the future rôle of tropical medicine in the development of the Caribbean region, but is also a vindication of the faith of those who, believing in its practical value, have labored in this country for the recognition and advance of tropical medicine. *C. W.*

Bubonic Plague in California.—The report of a fatal case of human plague in Contra Costa County, California, furnishes the text for a useful sermon on the eternal vigilance which is the price of our freedom from this dread disease. The persistence of the infection in ground squirrels renders necessary the continuance of the admirable measures of the United States Public Health Service now in operation, the which make possible such prompt recognition and control of cases. In the competent hands of the officers of our National Health Service, the citizens of the Pacific Coast and the rest of our country may rest assured that the scourge will be safely held in check.

C. W.

The Indian Journal of Medical Research.—The first number of this latest arrival in the field of tropical medicine journalism fulfills the highest expectation of the many who have been looking forward to its publication, and the succeeding numbers will be heartily appreciated by all who are interested in research in the wide field of tropical disease. The journal is the official organ of the Indian Research Fund and will replace both "Paludism" and the "Scientific Memoirs," which have published so much in the past that is valuable in the line of tropical disease investigation. The initial number comes to us

Digitized by Google

containing over 200 pages of a high type of original research and is illustrated with a generous allowance of beautiful plates, reproduced without regard to cost, as well as numerous charts and other illustrations. THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE welcomes its latest fellow, which we are sure will, under the guidance of its distinguished editorial staff, remain a worthy record of what is being done in India for research in tropical medicine. *C. W.*

Digitized by Google

ORIGINAL ARTICLES

A LIST OF THE MOSQUITOES HITHERTO REPORTED FROM NEW ORLEANS.*

CREIGHTON WELLMAN, M. D.,
and
HOWARD D. KING, M. D.,
(From the School of Hygiene and Tropical Medicine, Tulane University.)

The following paper is preliminary to a systematic mosquito survey of the city and environs of New Orleans which is planned by the School of Hygiene and Tropical Medicine of Tulane University for the coming spring and summer.

The medical and zoological literature has been searched with the object of recording previous work on New Orleans mosquitoes before taking up original studies on our own part. The present paper pretends, therefore, to be only a local faunistic one, and consequently we have quoted only observations which have been made on the spot.

Many references to mosquitoes have been valueless for our purpose because of lack of exactness in quoting localities. For instance, the long paper of Dupree (1905) dealing with many species has no exact data of this sort. The senior author of the present study has examined Dupree's collection, now in the National Museum, and none of the insects are labeled as coming from New Orleans. In the course of our examination of the earlier literature, we have met with several curious and interesting observations on the relation of mosquitoes to disease. For instance, Barton (1833) noted regarding yellow fever that "mosquitoes particularly were unusually numerous preceding the epidemic." He also called attention to the fact that sleeping under a mosquito net not only secured comfort, but prevented yellow fever. This observation was made in New Orleans forty-seven years before Finlay enunciated his mosquito theory of the disease. Nott (1848) also wrote of his observa-

*Received for publication September 10, 1913.

Digitized by Google

tions in New Orleans and argued at length for the reasonableness of the mosquito propagation of yellow fever. He says, in part, that "the slow and steady progression of yellow fever from a point * * * is at present inexplicable; it must be some form of living organism which multiplies and extends by organic laws. If in insect form, it is easy to understand its progress. Moreover, it is the business of some insects to distribute certain seeds of plants, far and wide, to carry the pollen of one plant to another to fructify it; and it may be the duty of others to disseminate diseases." And after considering other theories of yellow fever propagation, he concludes that "it would be quite as philosophical to suppose that some insect—like the mosquito, after passing through its metamorphoses takes flight—to fulfill its appointed destiny." Nott subsequently carried on a long controversy with his confrères regarding the mosquito propagation of yellow fever and other diseases.

Chaillé in 1898 mentions again in New Orleans that mosquitoes have "been suspected" of carrying yellow fever, but any careful study of mosquitoes in this city was not made until much later, as will be seen from the list we have compiled.

The classification followed is that proposed by Dyar and Knab in their various systematic publications on the Culicidae.

I. Gen. Anopheles Meig., 1818.

Veazie in 1901 wrote as follows concerning the presence of this genus in New Orleans: "I find this genus breeds in our swamps, natural ponds (where there are no fish or few) and suburban gutters; ponds that remain with more or less water all the time. They take from twenty to thirty days to go from egg to mature insect, temperature, wind, sunshine and rains influencing their growth, also the amount of their food products; if the water contains a few micro-organisms they do not thrive well."

The Mosquito Investigation Commission of the Orleans Parish Medical Society of 1902 added to this the following: "As a rule the females enter the dwellings of man about after sundown, but leave the house again before morning, unless they are too gorged or prevented from getting out, when they may be

Digitized by Google

found at rest in their characteristic position in the darkest corner of the room. Sexual congress with them, as with all other mosquitoes, takes place as soon as the female takes to wing after emerging from the pupa. The males, often collected into veritable clouds, are awaiting the event."

1. *Anopheles quadrimaculatus* Say, 1824.

Syn. *A. annulimanus* V. D. Wulp, 1867, *A. maculipennis*, Auctt. (American references only.*)

"Taken in large quantities during the summer and fall near the Tenth Precinct Suburban Police Station, Metairie Ridge." (Veazie.)

Under the name *Anopheles maculipennis* the commission above quoted gives these additional details: "In the heart of the city it has been found by your commission in isolated instances only; but in the outer districts it still exists in large numbers. But, strange to say, it was noted on the right bank of the river, and on a tour of investigation of the swamps in the rear of Gretna, no Anopheles were found. On this occasion, however, *Culex taeniorynchus* was very annoying in the swamps. Specifically *Anopheles maculipennis* is mainly responsible for the tertian and quartan varieties of malaria, but we owe the origin of the pernicious type, or aestivo-autumnal fever, to *Anopheles crucians* Wied., an insect which is not as rare as many authors have supposed."

Beyer also states (1901) that the species is "common in the vicinity of and in the city." This mosquito was repeatedly taken by one of us (Wellman) during September, October, May, June and July, 1911, near Tulane Campus and at Gentilly Terrace.

2. *Anopheles punctipennis* Say, 1823.

Syn. *Culex punctipennis* Say, 1823, *C. hiemalis* Fitch, 1851.

"Taken here in fall and winter; not very numerous." (Veazie.)

*A. *maculipennis* is a valid European species which has been confused with *quadrimaculatus*.

Digitized by Google

3. *Anopheles crucians* Wied., 1828.

"Taken here in summer and late fall; not very numerous." (Veazie.)

Beyer records the following interesting observation that this species is "an abundant pest in the salt and brackish water marshes along the lake shores east of the river, where they occur throughout the year, not even diminishing in numbers during freezing weather."

4. *Anopheles argyrotarsis* Rob.-Desv., 1827.

Syn. *Anopheles albitarsis* Arrib., 1891, *Nyssorhynchus albimanus* Blanch., 1905 (non Wied.).

Reported by Howard from New Orleans. This must have been a specimen introduced from the Tropics by shipping.

II. Gen. Megarhinus Rob.-Desv., 1827.

1. *Megarhinus septentrionalis* Dyar et Knab, 1906.

Syn. *Megarhinus herricki* Theob., 1906, *Megarhinus rutilus* Veazie, 1901 (non Coq.).

"Taken here by Prof. Beyer." (Veazie.)

The species found here and mentioned by Veazie is undoubtedly *septentrionalis*. The true *rutilus* has so far only been found in Florida. Coquillet (who probably saw Veazie's specimens) persistently misidentified this species, on account of its sexual dimorphism, calling the female *rutilus* and the male *portoricensis*. There are also specimens of *septentrionalis* in the United States National Museum, from Baton Rouge, La., and Benoit, Miss.

III. Gen. Janthinosoma Arrib., 1891.

1. *Janthinosoma sayi* Dyar et Knab, 1906.

Syn. *Culex musicus* Say, 1827, *Conchyliastis musicus* Coq., 1901, *Janthinosoma musicum* Theob., 1901, *Ianthinosoma mexicanum* Blanch., 1905 (non Bellardi).

"It has been sent to us from the country and also has been found by us in the outskirts of the city (Tulane University), and is, no doubt, a rural species." (Mosquito Investigation Commission of the Orleans Parish Medical Society, 1902.)

Digitized by Google

Say's name, *musicus,* was preoccupied and therefore Dyar and Knab's name must be used. Blanchard introduced the name *mexicanum* under the impression that Bellardi's species is the same as ours. It is, however, very distinct.

IV. Gen. Psorophora Rob.-Desv., 1827.

1. *Psorophora ciliata* Fabr., 1794.

Syn. *Culex ciliatus* Fabr., 1794, *C. molestus* Wied., 1821, *C. rubidus* Rob.-Desv., 1827, *Psorophora boscii* Rob.-Desv., 1827, *Culex perterrens* Walk., 1848, *C. conterrens* Walk., 1848.

"Its occurrence in this city is, as far as we have determined, rather a restricted one. Thus far it has been found in appreciable numbers in the vicinity of St. Louis Canal and the so-called Third or Hagan Avenue Canal, and in isolated instances in the Sixth District, near the river. The adult insects do not appear until midsummer, and for this reason their developmental stages are very likely protracted over a longer period than in other mosquitoes. The adult insects fly only at night, but are attracted by light." (Mosquito Investigation Commission of the Orleans Parish Medical Society, 1902.) This mosquito is locally known as the "gallinipper." According to old residents of New Orleans, it occasionally invades the city in clouds, disappearing after a few days. Taken near Lake Pontchartrain by us (Wellman) during September, 1911.

V. Gen. Mansonia Blanch., 1901.

Syn. *Panoplites* Theob., 1901.

1. *Mansonia perturbans* Walk., 1856.

Syn. *Culex perturbans* Walk., 1856, *Taeniorhynchus perturbans* Theob., 1907.

According to Beyer, this species "appears previous to the appearance of *C. pungens,* especially from the middle of May." He adds that it "becomes very numerous." Owing to its large size and pertinacity, this mosquito may be counted, undoubtedly, one of the most troublesome species. It diminished in numbers, however, very rapidly towards the middle of May. The species is also reported from New Orleans by Veazie. The Mosquito

Digitized by Google

Investigation Commission of the Orleans Parish Medical Society of 1902 states that it is a swamp form and does not breed in the heart of the city.

VI. Gen. Culex Linn., 1758.

"This genus is by far our greatest pest and breeds from about April until the latter part of November. It is the one that breeds in untold and incomprehensible numbers in our gutters, water closets, cisterns and large drainage canals." (Veazie.)

1. *Culex quinquefasciatus* Say, 1823.

Syn. *Culex pungens* Wied., 1828, *C. cubensis* Bigot, 1857, *C. pipiens* Coq., (pro parte, non Linn.), *C. pungens* Beyer, 1901, (non Wied.), *C. fatigans* Auctt.

This species was reported as "taken here" in New Orleans by Veazie in 1901, and Beyer says (1901) concerning it that it is "by far the most common of all, infesting not only the busy heart of the city, but also being found among the swarms of Anopheles in the more remote parts of the swamp lands. It is, moreover, comman all the year around, and an exact rehearsal of its periodic increase and decrease in numbers would be more than futile and superfluous; suffice it to say, that with the beginning of April, or sometimes a little later, we have to suffer twice a month from a visitation of this mosquito. This, of course, occurs at different times in different localities. If, for instance, the inhabitants of one section are very generally troubled, those of another are comparatively free during the same period. Its preponderance in numbers in nearly every section of the city is due to the fact that any small or large quantity of water in any kind of receptacle, from an old tin can, to the very Mississippi river, affords it opportunity to raise a progeny of two or three hundred or even more individuals. More than two hundred cisterns and other receptacles from nearly every section of the city were examined, forty-five per cent. of these localities furnishing larvæ of this species. Four additional investigations of the river itself showed abundant larvæ of *Culex pungens* in all stages of development, from ten to forty feet

Digitized by Google

from shore, in the more stagnant waters under the wharves at Race street, the Illinois Central Railroad fruit wharf depot, the Canal street ferry boat and the garbage boat at the foot of Robin street.

"For these four instances it must not be surmised, however, that the river in general is a breeding place for mosquitoes, as the localities indicated (and there are other similar ones as well) are really nothing but stagnant pools, in which the suspended sediment usually contained in our river water has settled, but in which decaying vegetable matter abounds.

"*Culex pungens* is a very annoying insect, which, however, chiefly goes on its foraging expedition only upon the approach of night, continuing until midnight, when its activity virtually ceases."

Coquillet (1906) also reports this species from New Orleans, La.

It should be mentioned here that Orr (1901), working in New Orleans, observed flagellates in "*C. pungens.*"

This species has been taken by Wellman at the Hutchinson Memorial, Tulane University, during September, October and November, 1911, and April, May, June, July and September, 1912.

Probably *Culex restuans* Theob., 1901, which undoubtedly occurs also in New Orleans, has been confused by some collectors with the above species.

2. *Culex salinarus* Coq.

Syn. *Culex nigripes* Coq., (non Zett.), *Culex impiger* Beyer (non Walk.).

"For the first time recorded for Louisiana, on April 25th of the present year (1901), when I took four males, and on May 2nd, two females, I have to agree with Mr. Pratt of Washington, in that it seems to be essentially a water closet mosquito." (Beyer.)

The Mosquito Investigation Commission of the Orleans Parish Medical Society of 1902 quoted also observed regarding it that "like all other mosquitoes, it is subject to fluctuating seasonal appearances, but as to localities, it is unquestionably and essentially a water closet insect, especially in the larval stages.

Digitized by Google

"In cisterns or water tanks, where, comparatively speaking, not much decaying vegetable matter, and, above all, no decomposing animal substances do, as a rule, occur, larvæ have thus far not been found. The adult insects were for the first time observed on April 25, and again on May 7. In the first instance, we found them at the entrance of the physical laboratory of Tulane University, and in the second in an ordinary backyard closet on Conery street, near St. Charles avenue. Since then, they have been taken in a number of localities as widely separated as those of the first two records. The larvæ feed upon excreted matter, and, therefore, our ordinary water closets, in which, unfortunately, our city abounds, should receive incessant attention and frequent oiling, if such be admissible in the premises."

This species is also reported from New Orleans by Veazie.

Here, too, it is almost certain that we are dealing with a wrong determination, and that *salinarus* is the species observed by the writers quoted.

VII. Gen. Culiseta Felt, 1904.

1. *Culiseta inornatus* Will, 1893.

Reported from New Orleans by Veazie and by the Yellow Fever Commission (1902), the latter of whom write concerning it that "it seems to breed in the same places and flies at the same hours as *C. pungens,* but in numbers it is far less and its seasonal appearance is earlier, occurring as early as the beginning of February. From then on, of course, it continues to appear from time to time." Beyer states that it is "the early form. During February and March it was far more common in the city than other species."

These notes are referred by their authors to *Culex consobrinus* Rob.-Desv., but we do not think this is the species in question and follow Dyar and Knab in calling it *Culiseta inornatus* Will.

VIII. Gen. Aedes Meig., 1818.

1. *Aedes calopus* Meig., 1818.

Syn. *Culex fasciatus* Fab., (non de Villiers, 1789),

Digitized by Google

C. calopus Meig., 1818, *C. frater* Rob.-Desv., 1827, *C. taeniatus* Wied., 1828, *C. mosquito* Rob.-Desv., 1827, *C. konoupi* Brille, 1832, *C. annulitarsis* Macq., 1846, *C. formosus* Walk., 1848, *C. excitans* Walk., 1848, *C. viridifrons* Walk., 1848, *C. inexorabilis*, 1848, *C. exagitans* Walk., 1856, *C. impatibilis* Walk., 1856, *C. zonatipes* Walk., 1856, *C. bancrofti* Skuse, 1886, *C. elegans* Fic., 1889, *C. rossii* Giles, 1899, *Stegomyia fasciata* Auctt.

This species, the "Stegomyia" or yellow fever mosquito, has been reported from New Orleans by many writers and still breeds in all quarters of the city in enormous numbers. Veazie says concerning it: "I think I am the first to record it in the United States. It was supposed to exist only in the West Indies." He also observed its habits and writes thus concerning them: "It is our day mosquito and is distinctly a house mosquito; it seems to remain in houses, and I think breeds especially in our cisterns and does not object to lay eggs before you in a glassful of water. You can get specimens any morning from your pitcher, if you have carelessly left it uncovered." Regarding its seasonal distribution, he remarks: "This mosquito can be found in most any house, from the first of May until frost. If the house is kept warm they will remain active the year around."

The Mosquito Investigation Commission of the Orleans Parish Medical Society of 1902 also records the following observations regarding this species: "*Stegomyia fasciata* is most decidedly a cistern breeder, but, unfortunately, in the suburbs of our city, it does not confine itself to such artificial breeding places alone, for the examination of twenty-one of the gutters in the Sixth and Seventh Districts, which breed at the same time *Culex pungens*, also showed in no less than sixteen the larvæ of the yellow fever mosquito. In the thickly settled and older parts of the city, however, it confines itself to cisterns and water barrels, for a thorough canvass of the same sections, which showed on former investigations *Stegomyia* in preponderance in the ciscterns, only yielded about 10 per cent of them in the gutters, whereas *Culex pungens* was found in 77 of the 82 different and far apart localities."

Digitized by Google

Boyce (1906) confirmed and extended the preceding observations and in his report we find the following: "Every yard contained one or more large unprotected water receptacles which gave rise to immense numbers of the *Stegomyia fasciata*, which, after they emerged from the pupa stage, immediately sought refuge and blood in the overcrowded living rooms a few feet distant.

"In the streets in the older parts of the town, the sanitation was comparable to the condition of the houses. The paving of the roads was exceedingly bad and irregular and allowed of the formation of numerous pools after rain. An open drain on each side of the roadway contained for the most part slowly moving or stagnant putrescent water. The sewage fungus, *Sphaerotilus natans*, and the red worm (*Chironomus*) were prominent everywhere where there was the least current."

Kohnke (1906b) also agrees that cisterns are the "main source of the yellow fever mosquito."

Howard (1903) reports specimens sent him from New Orleans; and Beyer, working here, published an elaborate description of the mouth parts of the female *Stegomyia* very similar to the work done by Nuttall and Shipley on the mouth parts of *Anopheles maculipennis*.

One of us (Wellman) collected *A. calopus* in the laboratory of Tropical Medicine of Tulane University every day from September 20, 1911, until December 11, 1911, also during July and September, 1912.

2. *Aedes infirmatus* Dyar et Knab, 1906.

Syn. *Ochleratus confirmatus* Arrib., 1891, *Culex confirmatus* Auctt.

The Mosquito Investigation Commission of the Orleans Parish Medical Society of 1902 states that this mosquito "occurs along the river front and in the swamps along the Spanish Fort Railroad track." Although referred by the above Commission to *confirmatus*, this should be *infirmatus*, as the two are distinct and *confirmatus* only occurs in the Tropics; *scapularis* is identical with *confirmatus* and has priority.

Digitized by Google

3. *Aedes sylvestris* Theob., 1901.

Syn. *Culex stimulans* Blanch., 1905, (non Walk.), *Culicida* (sic?=? *Culicada*) *maculatus* Theob., 1910 (non Meig.).

The same Commission reports regarding this species that "while it is not very numerous at any time, it has thus far often been found in the larval stages amongst the larvæ of *pungens* and even *Stegomyia fasciata* in the cisterns and water barrels."

Beyer adds that the mosquitoes belonging to this form "have as yet not been determined as far as their seasonal appearance in numbers is concerned. I have only found them, and still continue to do so, one or two at a time." The authors are doubtless wrong in calling their insect *stimulans*, which is a northern form, and *sylvestris* is almost certainly the species observed by them.

4. *Aedes excrucians* Walk., 1858.

The Mosquito Investigation Commission of the Orleans Parish Medical Society, 1902, reports this species, stating that it is "an altogether too common insect in our city. Previous to the appearance of *C. pungens*, this large, sometimes brown and sometimes nearly black-looking, yellow-ringed mosquito, becomes numerous, and in such places where it does occur, it is exceedingly troublesome. The first full flight of this species was noted from the middle of April to the end of May, when it gradually decreased in numbers without entirely disappearing. By the middle of July, it was very numerous again, especially during the early part of the night and in the morning hours, about daybreak. After sunrise it ceases to be troublesome or even to be noticed. The third flight occurs about the middle of September and while it can only be found in isolated instances in and about houses and the more thickly populated districts, it is exceedingly plentiful in the outskirts of the city. Thus far, this mosquito has never been noted by us as a cistern or even ordinary gutter breeder, but in larger pools and drainage canals, its eggs may be counted by millions. Experiments made with larvæ have demonstrated that great abundance of fresh vegetable food, such as *Oedogonium, Spirogyra, Stigioclonium,* etc., is absolutely necessary, and that ordinary refuse matter, upon

Digitized by Google

which *pungens* larvæ can successfully thrive, will simply starve them out. As algae of that kind are usually absent from our cisterns and water tanks, these places are not sought by the female of this species for the deposit of their eggs."

Beyer remarks regarding it that these insects "have not yet been determined as far as their seasonal appearances in numbers is concerned. I have only found them, and still continue to do so, one or two at a time." It would seem probable that here we have a wrong determination, as the type locality for this mosquito is Nova Scotia, although it is known to occur as far south as New York.

It is very possible that the above observations really have to do with *perturbans,* as the habits, breeding places, seasonal occurrence and other features mentioned exactly agree with what is known of the last named species.

5. *Aedes spenceri* Theob., 1901.

Syn. *Culex spenceri* Theob., 1901.

Although this species is reported from New Orleans by the authors last quoted, it is doubtless another misdetermination, as *spenceri* is a boreal form described from Manitoba.

6. *Aedes taeniorhynchus* Wied., 1821.

Syn. *Culex taeniorhynchus* Wied., 1821, *C. damnosus* Say, 1823.

The oft-quoted Commission states that this species is a swamp form and does "not breed in the heart of the city." Beyer adds that the "larvæ can develop in brackish water." This last observation accords with our knowledge of the habits of the species which is well known to be a salt-marsh breeder and periodically abundant along the littoral from New York to Argentine.

7. *Aedes fuscus* Ost.-Sack., 1877.

The Commission just named remarks of this species that "in its range, it is apparently a rural insect, rarely entering the city limits proper. It was taken as late as August 26, at the Athletic Park." According to Beyer, "as a rule, it is of rare occurrence."

Digitized by Google

8. *Aedes sollicitans* Walk., 1856.

Syn. *Culex taeniorhynchus* How., 1900 (non Wied.).

According to the Commission, these mosquitoes are "swamp forms and do not breed in the heart of the city." This species is also a salt-marsh breeder.

IX. Gen. Uranotaenia Arrib., 1891.

1. *Uranoetaenia sapphirina* Ost.-Sack., 1868.

Syn. *Aedes sapphirinus* Ost.-Sack., 1868.

"Taken here by Prof. Beyer." (Veazie.)

The writers wish to thank Mr. Frederick Knab, of the United States National Museum, who has determined specimens and given valuable help in settling points of synonymy.

References.

Augustin, George. 1909 a.—How Pestilence is Spread by Flies.—Summary of the Mosquito Doctrine.—Bibliography: History of Yellow Fever, Chap. 4, p. 44.

Beyer, G. E. (Prof.) 1901.—The Mosquitoes and Their Relation to Disease. (Read before the Louisiana Medical Society, April 19, 1901.) New Orleans Medical and Surgical Journal, v. lv (iii), September, 1901, pp. 131-155. Twenty-four figures in text.

———— 1902.—Mosquitoes of Louisiana. (Read before the Louisiana Society of Naturalists, 1904.)

———— 1904.—The Mouth Parts and Salivary Glands, Normal and Otherwise, of the Yellow Fever Mosquito. New Orleans Medical and Surgical Journal, v. lvi (xi), May, 1904, pp. 805-826, 6 pls. (Also reprint dated May, 1904.)

Beyer, George E., Pothier, O. L., Couret, M. and Lemann, I. L. 1902.—Bionomics Experimental Investigations with Malaria, in Connection with the Mosquitoes of New Orleans. (Read before the Orleans Parish Medical Society, November 30, as a report to the Society of the Commission on Mosquito Investigation). New Orleans Medical and Surgical Journal, v. liv (vii). January, 1902, pp. 419-480; 18 pls. and 2 maps. (Also published as pamphlet dated January, 1903.)

Blanchard, R. 1905.—Les Moustiques, Historie Naturelle et Medicale.

Boyce, Rupert. 1906.—Yellow Fever Prophylaxis in New Orleans. 1905.—Liverpool School of Tropical Medicine, Memoir XIX, April, 1906, pp. 1-62.

Carroll, James. 1906.—Yellow Fever in New Orleans and Its Bearing Upon the Health of the State. New Orleans Medical and Surgical Journal, v. lxix (iii), September, 1906, p. 185.

Chaillé, Stanford E. 1898.—Prevention of Yellow Fever and the Quarantine of Houses to Stamp It Out. Appendix—Letter from Dr. Geo. M. Sternberg. New Orleans Medical and Surgical Journal, v. i (xi), p 644.

Chassaignac, Chas. 1905.—The rôle of the Mosquito in the Propagation of Disease, Especially Malaria. (Annual Address of President of Louisiana State Medical Society). New Orleans Medical and Surgical Journal, v. lviii (i), July, 1905, pp. 33-47.

Coquillet, D. W. 1906.—A Classification of the Mosquitoes of North and Middle America. U. S. Department of Agriculture, Bureau of Entomology, pp. 1-31.

Dupree, W. H. (Dr.). 1905.—The Mosquitoes of Louisiana and Their Pathogenic Possibilities, with Remarks upon Their Extermination.

Digitized by Google

(Read before the Louisiana Naturalists Society.) New Orleans Medical and Surgical Journal, v. lviii (i), July, 1905, pp. 1-16.

Dyar, H. G., and Knab, Frederick. 1907.—On the Classification of the Mosquitoes. Canadian Entomologist, February, 1907.

Giles, Geo. M. 1902.—Handbook of the Gnats or Mosquitoes. (Second edition.)

Gill, S. G. (Dr.). 1904.—Mosquitoes in the Vicinity of New Orleans. (Read before the Louisiana Society of Naturalists, 1904.)

Howard, L. O. (Chief Entomologist, U. S. Department of Agriculture; Honorary Curator of Insects, U. S. National Museum; Consulting Entomologist, U. S. Public Health and Marine Hospital Service.) 1903.—Concerning the Geographic Distribution of the Yellow Fever Mosquito. Public Health Reports, v. xviii (xlvi), (Supplement, November 13, 1903), pp. 1-7; 1 map.

———— 1907.—Dr. Osler's Modern Medicine, p. 386.

Knab, F. 1912.—Personal Communication to the Authors.

Kohnke, Quitman, (?) a.—The Problem of Mosquito Destruction in New Orleans. (Delivered as illustrated lecture.) Report of Board of Health of the City of New Orleans, 1902-1903. (Also published as a reprint.)

———— 1906b.—Mosquitoes and Yellow Fever in New Orleans in 1905. (Read before the Thirty-second Annual Meeting of the Mississippi Valley Medical Association, at Hot Springs, Ark., November 6-18, 1906.) The Lancet-Clinic, New Series, v. lviii (xxvi), June 29, 1907, pp. 707-711.

Matas, R. (?)—Circular of Information Addressed to the Medical Profession for Distribution Among Trained Nurses and Others Intrusted with the Care of Yellow Fever Patients. Orleans Parish Medical Society. No date. (In text, the date of August 12, 1905, is referred to.)

Morgan, H. A. (Prof.) 1901.—On the Life Histories of Certain Mosquitoes. (Read before the Louisiana Society of Naturalists, 1904.)

———— 1902.—More Life Histories of Mosquitoes. (Read before the Louisiana Society of Naturalists, 1904.)

———— 1903.—The Mosquitoes in the Vicinity of the Gulf Biological Station. (Read before the Louisiana Society of Naturalists, 1904.)

Nott, Josiah C. (M. D.). 1848.—Yellow Fever Contrasted with Bilious Fever—Reasons for Believing It a Disease sui generis—Its Mode of Propagation—Remote Cause—Probable Insect or Animalgular Origin, etc. New Orleans Medical and Surgical Journal, v. iv (v), March, p. 588.

Orr, Henry B. 1901.—A Parasite of the Common Night—Mosquito (*Culex pungens*). New Orleans Medical and Surgical Journal, v. liv (vi), December, 1901, pp. 359-364; 1 figure in text.

Theobald, F. V. (M. A.). 1901-1910.—A Monograph of the Culicidae of the World. (5 vols. and 1 vol. plates.)

Veazie, H. A. 1901.—Some Observations on the Varieties and Habits of the Mosquitoes of New Orleans and the Remedies. (Read by title before the Louisiana State Medical Society, April, 1901.) New Orleans Medical and Surgical Journal, v. lv (iii), September, pp. 155-157; 16 figures in text.

———— 1912.—Personal Communication to the Authors.

Digitized by Google

AGAMOMERMIS RESTIFORMIS (LEIDY), STILES, (?) FROM THE HUMAN URETHRA.*

ALLEN J. SMITH, M. D.,
and
OSWALD E. DENNEY, M. D.
(From the Laboratory of Comparative Pathology of the University of Pennsylvania.

In July, 1911, a filiform nematode was forwarded to the writers by Mr. T. Lee Gore, a medical student of the University of Pennsylvania, from Wilmington, North Carolina, Mr. Gore having obtained it from a white man of the so-called "poor white class" met in the South, with the statement that he had passed it by way of the urethra. The man resided in one of the villages near Wilmington, was about forty years of age, a worker in a cotton mill and magistrate of the village in which he lived. He had previously complained of pain in the back, difficulty in arising from the sitting to standing posture, and of a bearing-down pain in the region of the bladder. There had been no difficulty or pain in micturition, and no grossly appreciable change in the urine. A few days before passing the worm he had taken a large dose of spirits of turpentine, which he believed had caused the dislodgement of the specimen. His wife saw him pull the worm from the urethra, and both were willing to make affidavit regarding the occurrence. Thereafter his symptoms all subsided and have not returned. Mr. Gore has personally assured the writers of his inability to discover reason for doubting the above statement in any particular; and from their confidence in Mr. Gore and the general similarity of Leidy's case, to be mentioned below, believe the actuality of this rare and unexplained parasitism.

As received, the specimen, preserved in alcohol, is of a light brownish-red color, opaque, smooth, rigid, somewhat coiled, and broken into three pieces aggregating 49.3 centimeters (almost twenty inches) in length. It is filiform almost uniformly cylindrical, averaging about half a millimeter in thickness. Its great-

*Received for publication July 26, 1913.

Digitized by Google

est diameter, 0.69 millimeters, prevails through the middle third and backwards, diminishing gradually from this part anteriorly; the tail end tapering abruptly to a bluntly conical tip. Neither head nor tail is curved upon itself. Anteriorly the diameter at a level of 1.9 cm. from the head extremity measures 0.53 mm.; from this level forward the worm tapers more rapidly, the base of the flatly rounded head measuring 0.066 mm. in thickness. Caudally from the level of greatest diameter the specimen tapers more gradually than anteriorly, measurement at three centimeters from the tip of the tail being 0.5 mm., and at 5 mm. from the tip 0.388 mm. From this last level the diameter abruptly diminishes into the bluntly rounded conical tip. (Fig. .)

With the lower powers of magnification the cuticular surface is smooth, without markings or other special features, and longitudinal lines are not apparent. On higher magnification (300-400 diameters) a fine spiral striation, criss-crossed by a deeper longitudinal straight striation, may be recognized. (Fig. .) This appearance is explained by the structure of the cuticle in transverse sections of the worm and in teased specimens of the skin. On the outside there is a very delicate homogeneous layer, beneath which occurs a layer made up of highly elastic fibrils arranged in a somewhat spiral manner about the worm. Beneath the latter follows a layer of finer longitudinal fibrillæ, and this is finally underlaid by a rather thick homogeneous subcuticular layer whose inner surface seems especially condensed into a basement layer for the muscle cells beneath. Over the head and body the cuticle (including subcutis) averages 0.016 mm. in thickness, increasing in the tail, where in the tip proper it attains a thickness of 0.053 mm. Anteriorly, 8.3 mm. from the head end, apparently in one of the lateral lines, there is a prominent flattened papilliform protrusion of the cuticle; but it is impossible to recognize any connection between this and the interior of the body or any of its contents, and it is therefore suspected of being artificial.

The terminal mouth is without lips, but there are apparent two fairly prominent lateral (?) and four indistinct and smaller submedian papillæ at the head end, equidistant from the oral

Digitized by Google

orifice. The opening of the mouth is round, about 0.01 mm. in diameter. Passing through the cuticle and carrying with it a cuticular lining the tube widens in its first tenth of a millimeter in fusiform fashion to a maximum diameter of 0.015 mm., thence narrowing and continuing in the oesophagus at a uniform diameter of 0.01 mm. The oesophagus is of cylindrical shape, muscular, with average diameter of 0.11 mm. It can be traced for a centimeter and a half from the head, but is then obscured (even after prolonged clearing of the specimen in glycerin) by a coarsely granular mass which occupies almost the entire body cavity throughout the length of the worm. An intestinal tube, largely obscured by these granules and globules, becomes fairly distinct in the last few centimeters of the specimen, measuring in this last position 0.085 mm. in diameter, dilating slightly near the tip of the worm, but ending blindly within the tip of the tail. The most careful search fails to show the existence of an anus, or of anal papillæ either at the tip or subterminally. At first the writers suspected the existence of an anal tube opening terminally, but upon more careful inspection have decided that the suggestive appearance is given by some of the cuticular filaments in their termination in the caudal tip.

Throughout the length of the worm, almost completely occupying the body cavity, is an apparently single sac with uncertain, incomplete and nonsymmetrical septa, filled with refractile globules of varying sizes. These globules in stained sections elect moderately the eosine of the haematoxylin and eosine combination, are insoluble in solutions of caustic potash and soda and in chloroform, and do not polarize. Their real nature is not known. The writers have suspected them to be of vitelline character, but it is quite possible that they are of the type of a reserve nutritive substance in the so-called "fat body," as Stiles interprets them in the Leidy specimen. "Fat cells," uniformly vacuolated, are met in sections, flattened between the sac of globules and the musculature; and among the globules, commonly adherent to them, are found coarse, granular, cell-like bodies showing a haematoxylin election. In sections taken from the level of the posterior break (thirty-six centimeters from the head) a large gland-like mass of large,

Digitized by Google

compressed cells was found between the body wall and the sac of globules; and in the substance of this structure the globules are apparently forming. The writers suspect this body, a bilateral structure, as ovarian, and the globules in its tissues and in the sac as vitelline, and probably myelinic rather than fatty. Aside from these the writers have been unable to even tentatively regard any part as belonging to the sexual apparatus, and believe the worm therefore to be undeveloped.

Anteriorly at 0.4 mm. from the mouth the oesophagus is encircled by a strand of fine fibres, the cephalic nerve ring; and in transverse sections of the worm median (?) nerve cords and ganglionic cells are met.

The existence of an excretory apparatus is uncertain. Close to the head end certain faint parallel, spirally adjusted lines suggesting the outlines of a tube are seen outside and along the oesophagus, lost posteriorly in the general obscuration from the globules above mentioned, seeming to open anteriorly into the upper part of the oesophagus (certainly not connected with the papilliform cuticular protrusion described in the cervical region). In the endeavor to preserve as fully as possible the gross specimen section was made of the worm only at the levels of previous fracture (22 and 36 centimeters from the head), and in the absence of sections of this anterior part it has been impossible to come to a decision as to the nature of this tube-like appearance and its possible relation with the pharynx in front or with a suppositious excretory gland at a more posterior level.

As seen in section, the musculature of the worm is of holomyarial type, not prominently interrupted by cuticular thickenings.

In identification of the specimen, the writers would urge as important features: a cylindrical filiform worm of peculiarly rigid consistence, terminal mouth without lips but surrounded by six papillæ, incomplete alimentary canal, practical absence of generative parts, and the peculiar diagonally striated fine markings of the skin, together with the holomyarial type of muscular arrangement. There can be little doubt therefore in establishing the example as an undeveloped form, probably the second larval stage of a *Mermis*. There seem in the points sug-

Digitized by Google

gested unquestioned exclusion of the only types liable to be confused as a gordian worm or the *Filaria medinensis.*

In 1880 Professor Joseph Leidy[1] published an account of a similar parasite obtained by Dr. C. L. Garnett from a laboring man in Putnam county, West Virginia, and deposited by Dr. Garnett in the Army Medical Museum in Washington. The worm, vividly red in color, had been passed from the urethra alive and moving. It was examined by Dr. Leidy for the Museum authorities some years after its reception and is described as follows: "Body long, restiform, nearly uniformly cylindrical, smooth, shining, elastic, tough, without evident annulation other than transverse wrinkling, with the anterior extremity evenly tapering in the continuous head, the end of which is rounded and smooth or without appendages of any kind; the posterior extremity not tapering, with caudal end incurved, bluntly rounded, without appendages and imperforate or without evident anal or genital aperture. Mouth a terminal pore without lips, papillæ, or armature of any kind. Pharynx cylindrical and opening into a straight cylindrical intestine, apparently ending in a blind pouch. Generative organs unobserved. Length of worm 26 inches; greatest thickness 1.5 mm. Width of the head just behind the rounded extremity 0.375 mm.; opposite the commencement of the intestine 0.625 mm.; at the middle 1.5 mm.; at the incurved caudal extremity 1.5 mm. Length of the oesophagus 1.125 mm." Dr. Leidy, in commenting upon the specimen, declared that it was "clearly neither a *Gordius* nor a *Mermis.*" He regarded it as more nearl yallied to the Filaridæ and proposed to distinguish it by the name *Filaria restiformis,* although stating that perhaps more intimate knowledge of its structure might in the future prove it to be other than a *Filaria.* In 1908 Stiles[2] re-examined the specimen, clearing it in glycerin and making sections of the body at levels where it had been broken. He found Leidy incorrect in his assertion that there are no oral papillæ, Stiles demonstrating six; and recognized the peculiar diagonal striation of the cuticle, which Leidy failed to

1. Leidy. Proc. Phila. Acad. Nat. Sci., v. xxxii, p. 10; 1880.
2. Stiles. Bull. Lab. Hygiene, U. S. P. H. and M. H. Service, No. 40; May 25, 1908.

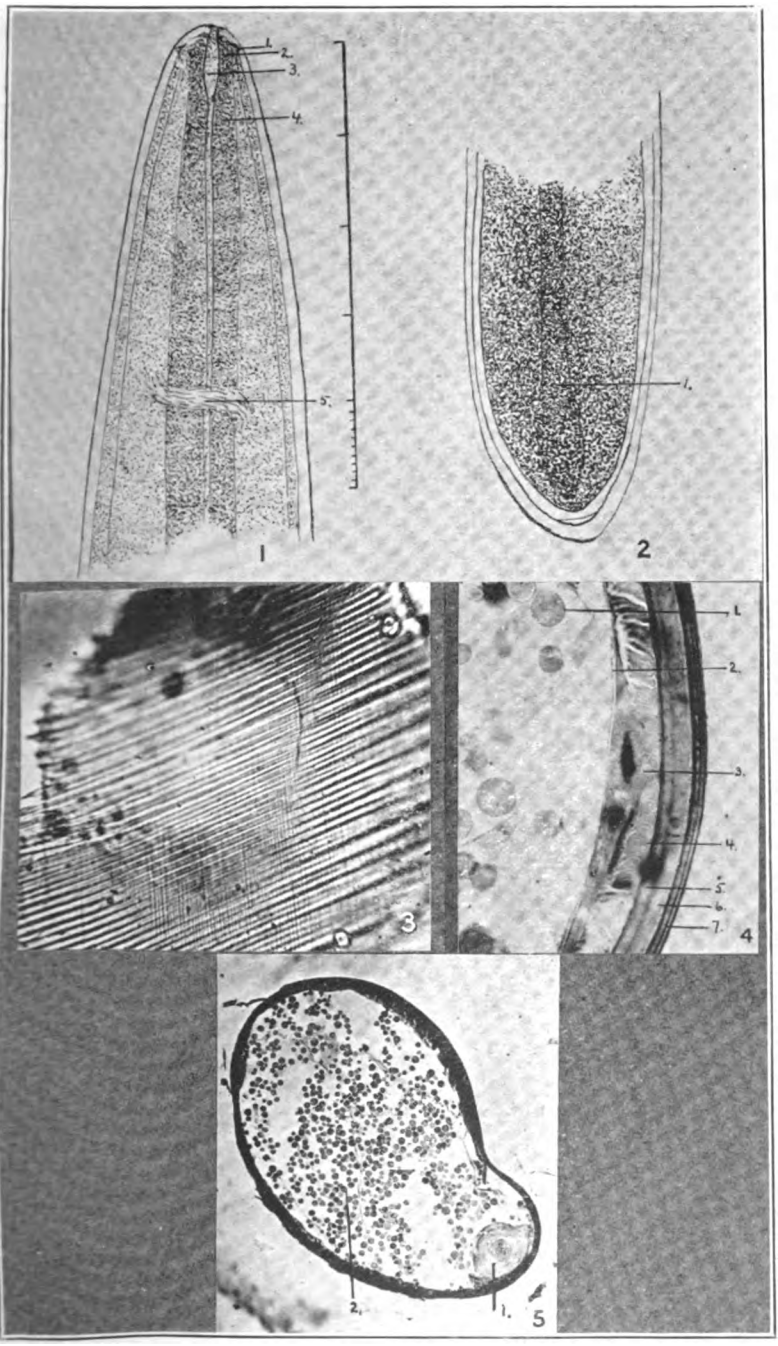
Digitized by Google

mention in his text but which he distinctly shows in an accompanying illustration. Basing his views upon the blind ending of the intestine and the peculiar markings of the cuticle, and excluding the Gordian worms because of the circumoral papillæ, Stiles has referred the Leidy specimen to the genus *Mermis,* proposing for it, inasmuch as it is evidently undeveloped (because of the absence of generative organs) the name *Agamomermis restiformis.*

That there are certain differences between the specimen here recorded and that described by Leidy and later by Stiles there is no doubt, and probably there exists difference of species, although this does not seem entirely certain to the writers. The Leidy example is considerably larger; the circumoral papillæ in the present specimen seem equidistant from the mouth, while in the Leidy specimen two (presumably lateral) are anterior to the other four; the oesophagus in the present specimen is apparently more distinctly muscular and somewhat more slender; and the tail ending is not in our specimen as rounded as in that described by Leidy. It seems, however, when it is recalled that both specimens are undeveloped and the precise specific identification impossible in either case, undesirable at present to insist upon a different nomenclature. Therefore the writers prefer for the time being to employ for the specimen recorded by them the existing name used for the older example. Doubt has been expressed as to the reality of parasitism as recorded in case of the Leidy specimen; Railliet[3] among others regarding the case as a spurious one. It is impossible for the writers to prove the actuality of the parasitic occurrence as above narrated, but they have made close inquiry and do not hesitate to accept the statement that the worm was actually withdrawn from the urethra of the subject as stated. The same type of infestment of the urinary tract in the Leidy case, the fact that these very similar worms should have been met in similar situation at long intervals of time and in places at considerable distance from each other, and infesting men in each instance of a type unlikely to have ever heard of such occurrence, make both cases to the minds of the writers all the more plausible and mutually con-

3. Railliet. Traité de Zoologie Méd. et Agricole, 1895, p. 530.

Digitized by Google



SMITH AND DENNEY AGAMOMERMIS RESTIFORMIS

Digitized by Google

Digitized by Google

firmatory. How infestment of a human being by a *Mermis* may be effected cannot be explained by any reasonable speculation based upon our present knowledge. These worms are practically always parasites of insects, and although it may readily conceived that they may be conveyed into the human alimentary tract with the insect which they infest, they are not known to be able to continue existence in such a situation, and, of course, it cannot now be conceived how they may pass to the urinary tract, or in fact, that these two examples have thus passed.

Explanation of Plate.

Fig. 1. Anterior extremity of specimen; 1, 2, papillae; 3, pharynx; 4, oesophagus; 5, neural ring.

Fig. 2. Tail end of specimen; 1, blind extremity of intestine (?).

Fig. 3. High-power photomicrograph of cuticle, showing its diagonal striations. (2 mm. oil immers.)

Fig. 4. Transverse section of body wall and margin of vitelline sac (?); 1, vitelline globule; 2, wall of vitelline sac; 3, nucleated protoplasmic portion of muscle cell, the extensions of which bud to form the hypodermic musculature in higher or lower levels (4); 5, 6, the hypodermis, thick and evidently laminated; 7, the laminated cuticle. (2 mm. oil immers. lens.)

Fig. 5. Transverse section of specimen at level of anterior fracture (low power); 1, section of atrophic alimentary canal; 2, supposed vitelline globules occupying the greater part of the body cavity, within a sac.

Digitized by Google

THE PROPER DIET IN THE TROPICS, WITH SOME PERTINENT REMARKS ON THE USE OF ALCOHOL.*

ALLAN EUSTIS, M. D.,
New Orleans.
(From the School of Hygiene and Tropical Medicine, Tulane University.)

In presenting my views on this subject it must not be inferred that my conclusions are based altogether upon theoretical reasoning, as most of my data has been collected during four years' practice in Southwest Louisiana, which can be considered in the summer months as very closely simulating conditions in the Tropics, from both climatic and sanitary viewpoints. Surface wells furnish the chief source of water and the inhabitants of this section are subject to a vast number of intestinal diseases peculiar to the Tropics.

In establishing a diet for any particular purpose, one must bear in mind the prime requisites of a suitable one. It must contain sufficient energy or fuel to supply the needs of the body at a minimum harm to the several organs. Many physiologists make the mistake of considering the first requisite at the expense of the latter, as when an excess of butter is added so as to furnish the desired fuel value, but at the expense of the digestive apparatus, which will soon rebel. We know from the experiments of Chamberlain, Vedder, Funk and others, as well as from some recent experiments of Wellman and Bass, that a diet composed of polished rice exclusively will soon result in an attack of beri-beri.

No one has paid much attention to the dangers of a meat diet in the Tropics, and it is upon this subject that I would lay particular stress. So that one may better follow the arguments brought forward, a brief résumé of the processes taking place in the digestion and assimilation of meat will not be out of place. In the stomach a portion only of the meat, which is taken as a type of protein, is converted into albumoses and peptones.

*Received for publication September 28, 1913.

Digitized by Google

the completeness of this conversion depending upon the digestive power of the stomach. In the small intestines, the peptones are split up into simple crystalline substances represented by leucin, tyrosin, arginin, histidin, tryptophan, uric acid, xanthine, urea and ammonia, which are rapidly absorbed and taken up by the body to build up its wasting tissues. It is fully accepted that protein material ingested is utilized only in this way and that any excess over the body needs in the presence of sufficient carbohydrates is promptly excreted by the kidneys as waste material, very little going to form fat or glycogen, the storehouses of energy.

It is self-evident, then, that the more muscular work performed by the body, the more proteid material will be required in the individual's diet. My former chief, Prof. Chittenden,[1] who first interested me in this line of work, was the first to attack Voit's old standard of 118 grams of proteid as the requisite amount of proteid material necessary in twenty-four hours. Working with several squads detailed by the United States Army, he proved that the men could do better and more work on less than the usual amount, and showed that for a man engaged in teaching or laboratory work, only 36 to 40 grams of proteid was necessary, provided abundant carbohydrate food was furnished in its place. His results have been amply verified by Klemperer,[2] who obtained nitrogenous equilibrium with 33 grams of proteid, by Peshell[3] with 40 grams, Siven,[4] Landengren,[5] Cedercreutz[6] and Ernberg,[7] while Combe,[8] in discussing Chittenden's results, states: "A summary of all these researches shows that modern investigations have completely and absolutely vindicated the vegetarians, the Europeans and particularly the Japanese, who assert that the nitrogenous ration may be diminished without disadvantage." My clinical experience has amply borne out Chittenden's original teachings, as a brief review of the cases reported will demonstrate.

In order to understand what harm an excessive meat diet may do, we must understand what becomes of the undigested meat, the unabsorbed crystalline substances and the albumoses and peptones, when they reach the large bowel and remain therein from twenty-four to forty-eight hours in the presence of the

Digitized by Google

putrefactive bacteria of the colon. Exposed to these latter organisms the undigested meat undergoes putrefaction, with the formation of albumoses, peptones and amino acids, similar to pancreatic digestion, but with the formation of various poisons by further cleavage of the nutritive principles.

Tryptophan forms indol, which has been shown by Herter,[9] and Richards and Howland,[10] to have decided pathological influence, while an amine or alkaloid is formed from each amino-acid by the splitting off of carbon dioxide. A paper to appear shortly will describe the pathological changes produced by injections of these several amines, and it is only necessary to state that putrescin and cadaverin, tetramethylenediamine and pentamethylenediamine, respectively, are formed in large amounts. These two ptomaines are highly toxic and when injected intravenously into guinea pigs, cause death at once, from doses as small as one milligram. Under ordinary conditions these poisons are rendered inert by the liver cells by combining them with organic acid, but by overwork, the hepatic tissue loses its power of detoxicating these substances, allowing them to pass into the general circulation, giving rise to definite symptoms.

The symptomatology of this toxemia is definite and characteristic. There is a general feeling of languor, vertigo, frontal and occipital headaches, a drawing feeling in the post cervical region, vague body pains, especially between the shoulders on awakening in the morning, irritability of disposition and symptoms so often classified as neurasthenia. Constipation is by no means the rule, a daily stool occurring as often as the former. These patients are usually pale, with cold extremities and low blood pressure, due to the absorption of putrescin and cadaverin, which lower blood pressure. Another type, however, due to absorption of pressor amines presents high blood pressure, florid skin ,vertigo and fullness in the head. Both types present excessive indicanuria and the symptoms disappear on a low proteid diet.

Not only has the liver the power to burn up these amines, but all of the tissues possess more or less similar action, so that if one is exercising strenuously, or if the weather is cold and the

Digitized by Google

body is called upon to oxidize considerable material, in order to maintain the normal heat of the body, these toxic substances are soon gotten rid of. In the Tropics, however, where few of the inhabitants resort to strenuous exercise, and where there is very little need of internal combustion to maintain the body temperature, an excessive meat diet is paramount to taking so much poison.

Fred S. Lee,[11] a former co-worker of mine, has shown that if two corresponding muscles are irrigated, one with physiological salt solution, and one with 1-2000 indol in physiological salt solution, that the indolized muscle is capable of contracting only 55% of the other.

As a general rule not more than 40 grams (1⅓ ounces) of protein should be eaten per day in the Tropics. Mendel[12] has recently proven not only that vegetable proteids are utilized as readily as animal, but in addition, that carbohydrates will save the tissue proteids to a great extent in starving dogs, so that we are justified in adding largely of carbohydrates, but not to the extent of Voit's standard, viz., 3000 calories, but furnishing the needs of the body with 2000 or 2500 calories, depending upon the muscular work done. Fats should be taken in moderation owing to their high potential energy with the production of an abundance of heat on combustion. A diet composed of vegetable proteids, which do not yield on digestion as many toxic substances as animal proteids, is indicated, with an abundance of fruits and vegetables. It would certainly seem that Nature meant such to be the case, as vegetables and fruits flourish especially in the Tropics, and can be secured in abundance.

Since Atwater[13] brought out the fact that alcohol in moderate amounts was capable of replacing carbohydrates and fat to a small extent, and that it possessed a calorific value of 7 as compared to proteid 4.1 and carbohydrate 4.1, laymen have taken occasion to excuse many a drink. In moderation, I see no physiological reason why an occasional alcoholic drink will harm, but when persisted in, the body is overtaxed with a poison which the liver is taxed to oxidize, in a climate in which there is no indication for same. My attention has been called to the fact

Digitized by Google

that the Mexicans drink largely of "pulque," but even in this there is but 5% alcohol, which corresponds to our beer. I have purposely not dwelt upon the calorific value of the food, as I believe if a small amount of meat, or better still, a diet composed of beans, peas, bananas, alligator pears, fruits and cereals, together with an abundance of water to replace that lost by perspiration, the best guide to the needs will be the appetite, and the gain or loss in weight.

The following case is of interest:

Mr. E. J. T., 37 years old, a native of England, had never known a day's illness until he came to New Orleans and engaged in the cotton business. He consulted me for pains between the shoulder blades upon awakening in the morning; languid feeling and inability to take his usual interest in his business. While in England he had been accustomed to daily exercise, but since his residence in New Orleans (six weeks previous) he had taken none. Family and previous history was negative except for an attack of rheumatism six years before. He had always been a meat eater but with no ill effects. Examination showed a well-nourished, muscular, but anemic individual. All the organs were normal except hypertrophy of the heart. Apex 4 cm. outside of nipple. Urine 1.028, acid and containing great excess of indican. Weight 172 pounds.

He was given a purgative of calomel, phenolphthalein and rhubarb, and advised to eat as little meat as possible, with a Turkish bath twice a week, and to keep a record of his diet. The following can be taken as an average day:

Breakfast—One orange, two ounces of oatmeal and cream, bacon one ounce, fried grits two ounces, three slices of baker's bread, two cubes butter, two batter cakes and cup of coffee.

Dinner—Three slices of chicken breast, one sweet potato, two ounces rice and gravy, three slices baker's bread, butter two cubes, two slices sponge cake, jelly, one cup of coffee with sugar.

Supper—Two slices chicken breast, three pieces bread, one slice sponge cake, one cup of tea.

This is a good type of a Sunday diet and furnishes ample energy, 2850 calories, with only enough proteid to meet the needs of the body. The days he ate meat he did not partake of

Digitized by Google

eggs, and vice versa, alternating with a day in which he obtained his protein from peas, beans and peanuts. I observed him from January 2, 1911, to March 30, 1911, during which time he followed such a diet, with no medication except the initial purgative, and aspirin for the first two days. In one week his symptoms had entirely disappeared. He felt energetic, indicanuria had disappeared, and on March 30 he weighed 190 pounds, a gain of 18 pounds. This gain in weight demonstrated beyond a doubt that he was receiving ample proteid.

This case is only a type of several hundred which I have observed since reading my first paper on the subject in 1905. And the more attention I have paid to the subject, the more convinced have I become that the average individual in the South partakes of too much meat.

Bibliography.

Chittenden. "Physiologic Economy of Nutrition." Stokes, N. Y., 1904.

2. Klemperer. Zeit, F. Klin. Med. Bd. 16.
3. Peshell. Dissertation, Berlin, 1890.
4. Siver. Skand. Arch. f. Physiol. Bd. 11.
5. Landengren. Skand. Arch. f. Physiol. Bd. 14.
6. Cedercreutz. Dissertation, Breslau, 1902.
7. Ernberg. Dissertation, Stockholm, 1903.
8. Combe. Auto-intoxication, Rebman Co., 1908.
9. Herter. Pathological Chemistry, Lea Bros. & Co., 1902.
10. Howland and Richards., Archives of Pediatrics, 1907, v. xxiv, p. 401.
11. Fred S. Lee. Columbia University, quoted by Strickland, Indianapolis Medical Journal, October, 1911.
12. Mendel. Journal of Biological Chemistry, October, November and December, 1911.
13. Atwater. "The Nutritive Value of Alcohol," Physiological Aspects of the Liquor Problem, (2), 1903.

Digitized by Google

REMARKABLE EMACIATION IN A CASE OF HOOKWORM DISEASE.*

ALFRED MOORE, M. D.,
Memphis, Tenn.

This man is a ward patient at St. Joseph's Hospital. He is 20 years of age and has lived in a tent most all his life, following trapping and hunting for a living. He says he was perfectly well up to one year ago, when he had typhoid fever and from which he never regained his strength. He was sent from his home near the mouth of the St. Francis river to Helena, where his case was diagnosed tuberculosis, and was directed to the

*Received for publication September 26, 1913.

Digitized by Google

City Hospital here, where he was treated for pellagra for several weeks before he was brought to St. Joseph's Hospital. He was unable to eat and retain but little nourishment. Diarrhea was his most aggravating symptom. No cough, and heart and lungs did not show any lesion. Urinalysis negative. No skin lesions, except from pressure due to lying in bed. Hookworm disease was diagnosed and thymol given, which gave almost prompt relief from the distressing diarrhea. Fowler's Solution, Bulgarian Bacillus Tablets and Hexamethylenamine were also ordered with instructions to increase his diet as rapidly as possible. He has made rapid improvement during his four weeks in the hospital, and we are confident of his ultimate recovery.

The accompanying pictures were taken three weeks after admittance, when he had gained considerably in weight and was able to walk.

THE RAPID CURE OF POLYNEURITIS GALLINARUM BY INTRAMUSCULAR INJECTION OF A SUBSTANCE ISOLATED FROM RICE—NOTE ON THE PATHOLOGY OF THE DISEASE.

A Preliminary Report.

CREIGHTON WELLMAN, M. D.,
ALLAN C. EUSTIS, M. D.,
and
LEONARD C. SCOTT, M. D.,
New Orleans.
(From the School of Hygiene and Tropical Medicine, Tulane University.)

The general consensus of opinion regarding the etiology of so-called experimental *Polyneuritis gallinarum* seems to point to the deficiency of some substance in the diet, which is responsible for a disturbed metabolism leading to a definite chain of symptoms. The sequence of the latter and their characteristic manifestations is the same regardless of the animal or fowl experimented upon. Among the numerous observers Fraser and Stanton,[1] Funk,[2] Chamberlin and Vedder,[3] Schaumann,[4]

*Received for Publication, September 28, 1913.

Digitized by Google

Eijkman,[5] Gryns,[6] and Teruuchi[7] have done the most to prove that the removal of the cortical layer of rice grains was responsible for the symptoms, when polished rice was given as a steady diet for at least 30 days. This has been substantiated by the feeding of the cortex either alone or together with decorticated rice, with the result that symptom complex of polyneuritis either disappeared, if it had begun to show itself, or remained absent, if feeding was commenced in time. Fraser and Stanton[8] went further and proved that the protective or curative agency, according to the stage at which it was used, could be extracted from the rice polishings by treating with alcohol acidulated with HCl. These observations have been amply confirmed by Schaumann,[9] Chamberlin and Vedder,[10] and especially Funk,[11] whose attempts to isolate the substance have been so successful as to allow of his giving it a provisional formula. He obtained similar substances from both rice polish and yeast, but the amounts obtained even from 54 to 75 kg. respectively were so small as not to allow of more than a few tests with reference to its curative qualities and two elementary analyses. He has named the substance *beri-beri vitamine,* regardless of the fact that beri-beri in man and the so-called polyneuritis of fowls, while the underlying principles may be the same, in as much as both are undoubtedly the outcome of disturbed metabolism, still are pathologically and to a great extent symptomatically widely divergent maladies. His results have been very convincing and an attempt was made to carry out experiments along the lines indicated by Funk and if possible to verify and extend his results. For that purpose the following preliminary investigations were started, using healthy chickens on diets of polished rice, grits and sago, which Wellman and Bass[12] have proved produces this polyneuritis equally as well. In the interval before the symtoms should show themselves, extracts of comparatively small quantities of rice polish varying from 2-12½ kgs. were made, using as extracting medium ½% HCl alcohol. The method was in most respects the same as that employed by Funk, except that after concentrating and neutralizing with NaOH, $Ba(OH)_2$ was added and the Ba Soaps together with the precipitated phytin filtered off. Barium was eliminated

Digitized by Google

with CO_2 and H_2SO_4, following which came the precipitation with phosphotungstic acid, its decomposition with Baryta and concentration if the filtrate in vacuo at 50-56° C. The process was stopped at this point, the amounts of concentrates being small, and injections made into the pectoral muscles of chickens during the stage of convulsions. The intramuscular injection of the curative substance is so far as known done here for the first time, and indicates in the few successes that it reacts directly by way of the circulation, independent of alimentary or hepatic processes.

As was previously indicated, the number of cures directly traceable to the injections was comparatively small, only two of the first seven receiving the extract recovering completely. Yet these cures were of so undoubted a nature that another series of eighteen chickens was immediately started, using the same method of administration. The work in this series is not yet complete. Many of the chickens were in the last stages of paralysis, which experience has shown to precede death, and could oftentimes be saved by the introduction of rice polish emulsion directly into the craw by means of a catheter when extracts had failed to react. The failure with extracts may be accounted for by modifications in the methods of preparation and the length of time required to concentrate with the available apparatus. However that may be, the extractions will be continued in on larger amounts of rice polish in the hope of eventually isolating a crystalline product whose composition may be determined and which will be both prophylactic and curative in action.

The results of the pathological examination of fowls dying from polyneuritis agree in general very well with those recorded by Vedder and Clark.[13] The balling together, clumping, segmentation, and granular structure of the diseased myelin, has been found to a greater or lesser degree in all of 12 chickens, the nerves of which were examined. These included as a routine procedure sections of the sciatic, the brachial plexus, vagus in the neck and the stomach branch. Besides these the splanchnics and branches of the lumbar plexus have been examined in some cases and show distinct alterations. The nerves were stained

Digitized by Google

with Osmic acid as a general stain, and celloidin sections both horizontal and transverse were made, using Weigert and Van Giesson stains after appropriate preparation. Proliferation of the nuclei of the neurilemma or of the endoneurium have not been noted so far, and in many fibres in which the disturbance in the myelin seemed to have reached a considerable degree, the axis cylinder could be seen intact. Cross sections of the various parts of the cord, the medulla, cerebellum and the cerebrum were made, with negative results so far as pathological findings were concerned. A section through a spinal ganglion with distal portion of nerve attached revealed the myelinic alteration in the distal portion. The ganglion cells were apparently intact, the nuclei still to be seen, though faintly. The anterior horn cells were still in their places, though whether there were any alterations in the Nissl's bodies remains to be investigated.

One pathological finding which occurs with a fair degree of uniformity is the presence of circumscribed subdural haematomas, 1-1½ inches long along the cord, being usually located in the cervical, dorsal and lumbar regions. The vessels of the dura over the cerebellum are widely distended, and sometimes there are extravasations over the cerebral lobes. Whether or not these are to be considered the cause of the tetanic convulsions, which are usually but not always coincident with the paralysis, must be corroborated by further investigation. The very fact that they occur isolated and fairly uniformly localized, excludes gravitation.

The authors also have examined the heart, liver and kidneys microscopically for degenerative changes, but so far the results do not warrant definite conclusions. Pericardial effusion and marked dilatation are by no means the rule, but occasionally occur. The sections of the liver and kidney showed normal tissue in those examined.

The authors think they are justified in the provisional conclusions:

1. That the curative substance acts independently of the liver or alimentary tract, and that it is readily absorbed from intramuscular injections.

Digitized by Google

2. That degeneration of the nerves is confined principally to disturbance in the myelin sheath of the fibers.

3. That neither the sensory nor motor tracts of the cord, medulla or brain undergo any observable changes.

4. That there is a possibility that the cause of convulsions may lie in spinal irritation caused by subdural haematomas due probably to increased permeability of the vessel walls.

Further series of investigations are in progress which it is presumed will clear up many obscure points, especially with reference to the etiology of the convulsions and their coincidence with the paralysis. Besides this, the questions of the coagulability of the blood and the action and chemical constitution of the curative agency will receive attention, so that with the conclusion of our experiments one step further may be advanced in the elucidation of etiology of the so-called *Polyneuritis gallinarum*, more properly a *Degeneratio parenchymatosa nervorum gallinarum*, and its hypothetical relationship to the true polyneuritis of the tropical human malady—beri-beri.

References.

1. Fraser and Stanton. Studies from the Institute for Medical Research. Federated Malay States. No. 12, 1911.

2. Funk. The Journal of Physiology, v. xliii, No. 5, December 22, 1911.

3. Chamberlin and Vedder. Transactions of the Far Eastern Association of Tropical Medicine. Congress held 1912.

4. Schaumann. Archiv für Schiffs-u. Tropenhygiene. Bd. 15. Heft 22, 1911. Also Bd. 16, Heft 11, 1912.

Eijkman. Jaarverslag. v. Lab. v. Path. Anat. u. Bakt. over het jaar 1895. Botona '96. (Quoted by F. & S.)

6. Gryne. (Quoted by Schaumann from Funk.) Journal of Physiology. v. xliii, No. 5, and Fraser and Stanton, Studies from Inst. of Med. Research. Fed. Malay States. No. 12.)

7. Teruuchi. (Quoted from Funk, *ibid.*, and from Chamberlin and Vedder. Transactions of the Far Eastern Association of Tropical Medicine. Congress held 1912.)

8. Fraser and Stanton. (In previous quotation.)

9. Schaumann. Archiv für Schiffs-u. Tropenhygiene. Bd. 16. Heft 11, 1912.

10. Chamberlin and Vedder. Philippine Journal of Science, v. vi, No. 5, November, 1911.

11. Funk. The Journal of Physiology, v. xlv, Nos. 1 and 2, August 2, 1912.

12. Wellman and Bass. This Journal, No. 2, v. i.

13. Vedder and Clark. Philippine Journal of Science, v. vii, No. 5.

Digitized by Google

A BACTERIOLOGICAL STUDY OF THE WATER SUPPLY OF NEW ORLEANS.*

CHARLES LOUIS JACOB, M. E.
(From the School of Hygiene and Tropical Medicine, Tulane University.)

Contents.

INTRODUCTION.
HISTORICAL.
TECHNIQUE AND PROCEDURE.
Definition of *B. coli.*
Estimation of *B. coli.*
Presumptive tests for *B. coli.*
DISCUSSION OF DATA.
Relation of Turbidity, Count and Stage of River.
Sanitary Survey of Intake.
Extent of Pollution of River.
Flora of River Water.
Efficiency of Steps in Process.
Discussion of Results.
Routine Analysis as carried on at Plant.
Criticism and Need of Revision.
Relation of Mississippi River Water to Typhoid Fever.
CONCLUSIONS.
REFERENCES.

Introduction.

The quality of any surface water whose drainage area is beyond the sanitary control of the community using that water as a source of supply, is a very variable quantity.

New Orleans obtains its water from the Mississippi and after proper treatment the water is furnished to the consumers through distribution mains.

The possibility of using this water as a beverage and of adequately clarifying it was investigated by Mr. R. S. Weston[1] in 1901. As demonstrated by the above investigation, the river showed at that time no evidence of sewage pollution for the indicator, *B. coli communis,* was isolated in only three per cent. of samples examined and quantities of water varying from one to three hundred cubic centimeters were used in its determination; therefore the investigation resolved itself into

*Received for publication October 6, 1913.

Digitized by Google

working out a process that would sufficiently clarify the water.

The writer doubted whether the water of the Mississippi River is as free from contamination at the present day as it appeared to be in 1901, and since this investigation he is convinced that it is not.

A study of the typhoid death rate reveals the fact that it is unnecessarily high and is fairly constant for the last eight years. The quality of the water has had a sufficient lapse of time to exert its influence on the community, but the high typhoid rate has been maintained in spite of the installation of purification plant. Is it, then, that the treatment fails to purify, owing to the increased pollution of the river, or is it that the plant yields a satisfactory effluent and that we must look to other factors for the continued high rate? It was with the object of finding out the sanitary efficiency of the purification treatment and the extent of the pollution of the Mississippi River that this investigation was started.

Historical.

The water supply of New Orleans up to the operation of the present Municipal Purification Plant in 1909 was derived from three principal sources: cisterns, Mississippi River, and shallow wells.

The cisterns were by far the most generally used of the three. According to an investigation of Dr. Smart[2] in 1880, the water became "foul on standing and storing generally deteriorated rather than improved the character of the water." From the worst cypress cisterns this water was chemically and microscopically the same as swamp water. Occasional droughts of two and three months duration were hardships that the community felt less and less disposed to undergo as the city progressed.

The raw Mississippi water was next introduced to afford fire protection and for flushing the streets. These plugs in time of drought were eagerly sought by the people whose only supply was cistern water. House connections were also made, but the muddy character of water prevented its wider distribution. The two factors that prevented the greater adop-

Digitized by Google

tion of the Mississippi water as a beverage were, that only those who could afford filters would be assured of a clear water, and that the water rates were excessive.

Some few people obtained their supply from shallow wells, but these were not generally used and were dug principally by people living on the outskirts of the city.

There always was a demand for a purer, clearer water supply than that available, and the New Orleans Water Works Co., to meet this demand, tried to filter the water, but owing to the microscopic character of the silt carried in the river, the effort was a failure.

In 1898, in testimony taken in an investigation of the New Orleans Water Works Co., many chemists expressed the opinion that the Mississippi water, properly coagulated, could be filtered. In 1900 a Board of Advisory Engineers appointed by the Sewerage and Water Board passed a resolution asking for an appropriation to conduct experiments on the water of the Mississippi. Mr. R. S. Weston was placed in immediate charge of the work and investigation started December 15, 1900, and lasted until August 17, 1901. Mr. Weston used sulphate of alumina as coagulant. His conclusions were that the American system was best adapted to clarifying the Mississippi River water at New Orleans.

The objection to this process was that it did not soften the water. By the time that actual construction had begun the lime and iron process had been developed to such a stage that it could be adopted and water clarified and softened for the same price per gallon that the clarifying by means of sulphate of alumina would cost.

This process was therefore introduced and as seen from the published reports of the Sewerage and Water Board the alkalinity of raw water has been reduced on the average about 40%. The average alkalinity of the filtered water for the year 1911 was 38 P. P. M. with a minimum of 26 and a maximum of 62 P. P. M.

The method of treating the water is known as rapid mechanical or American system of filtration. The raw water is pumped into the grit reservoir, through which it flows at the

Digitized by Google

very slow velocity of 600 feet per hour. Here the larger particles settle out. From the grit reservoir the water enters the baffles, where lime is added, and about midway between intake and outlet of baffles the coagulant, ferrous sulphate, is added. The velocity maintained in these channels is about 1 foot per second, which is sufficient to prevent any precipitate on bottom of run and to carry all fine particles which have now been brought together into coarser clumps, out into the coagulation basins, where no appreciable velocity exists, and there these clumps readily subside. The effluent of these basins is skimmed off and brought to the filters. After passing through these the water is pumped directly into the distribution mains.

Technique and Procedure Adopted in This Investigation.

All samples were collected in eight-ounce bottles and plated within an hour of collection. These samples were taken by the writer and every precaution was exercised to obtain a fair sample. All bottles used were glass stoppered and previous to sterilization were covered with tin foil. Samples were taken at a depth of one to two feet.

As considerable difficulty was experienced in obtaining samples from intake and grit outlet, owing to distance from platform to water surface being over five feet, a holder was devised and constructed by the writer to enable him to obtain a sample in a satisfactory manner.

By manipulating the string, the stopper can be pulled out and replaced, the entire operation being performed under water. This holder the writer recommends for taking samples in swiftly moving streams, provided a suitable weight be attached. There was quite a current at the intake to grit reservoir, and apparatus worked satisfactorily.

The samples taken were plated out on nutrient agar and incubated for 24 hours at 37°, then counted by the aid of a pocket lens. Dilutions of one-tenth and one-hundredth were used in plating out the intake and grit samples, but the remainder were plated directly. Duplicate plates were made in every case and in many instances three plates were made from each sample. One and ten cubic centimeters of both raw and

Digitized by Google

filtered waters were planted in lactose bile fermentation tubes at time of plating.

Equal amounts of water were placed in dextrose liver broth, but the use of this medium was discontinued, as the water contained a dextrose splitter that obscured the gas formed by the colon bacilli and by overgrowth made the isolation of the latter very improbable. This dextrose splitter did not break down lactose and little trouble was experienced in the bile tubes.

The procedure from this point was to plate out on lactose litmus agar any tube that showed gas within twenty-four hours after inoculation. If, however, gas was not present at the end of twenty-four hours, the tubes were returned to the incubator and plates made when gas was formed, provided such formation occurred within seventy-two hours, after which time the tubes were discarded.

In the beginning of this investigation this transfer to the lactose litmus agar plates was made by taking a loopful of the bile from a tube that showed gas inoculated with smallest amount of sample, and streaking this back and forth four times across the surface of the agar without refilling the loop. After a few tests it was found that better results could be obtained by putting the loopful from the bile tube into a tube of sterile water and then, after shaking, plating out one-fifth cubic centimeter of this on the lactose litmus agar plate. This change was necessary as the colon bacillus was lost several times due to overgrowth on the streaked plate.

The red colonies, after twenty-four hours incubation at 37°, were fished and planted on agar slants, from which slants the following media were seeded: gelatine slant, litmus milk, litmus lactose broth, neutral red dextrose broth, peptone water.

The technique adopted in the determination of species varied somewhat from that of the American Public Health Association.[3] All specimens were obtained from colonies on agar plates in nutrient broth and incubated at 20° for twenty-four hours, then transferred into another set of broth tubes and incubated for twenty-four hours at 20°, from this another

Digitized by Google

set of broth cultures was made at same temperature and incubated for same length of time.

To avoid working with a mixed culture gelatine plates were made and incubated at 20° for forty-eight hours. Colonies were fished from these plates and streaked on agar slants which were incubated for twenty-four hours at 37°.

Motility was determined by making hanging crop preparations from 24 hour agar slants.

Fermentation tubes containing dextrose, lactose and saccharose broths were inoculated from the agar slants and incubated for forty-eight hours at 37°.

Milk, nitrate broth and peptone water were inoculated and incubated at 37°, the former for fourteen days, the latter two for four days.

Gelatine slants and stabs were made and incubated at 20°, the former for four days and the latter were kept for fourteen days.

Nutrient broth tubes were inoculated and incubated for twenty-four hours at 37°. From these another set of hanging drop preparations was made to determine motility of organisms in growth from a liquid medium.

The spore formers were next determined. The broth tubes above mentioned after forty-eight hours' growth at 37° were placed in a water bath and kept at 80° for ten minutes, then streaked cultures on agar slants were made from these tubes and inoculated at 37° for twenty-four hours. Slides were made and stained by Moeller's method from all agar slants that showed growth in twenty-four hours.

The ability to develop anaerobically was next investigated. Tubes containing nutrient broth were heated to drive off the dissolved oxygen, quickly cooled and inoculated, then medium was drawn up in bulb by means of glass tubing extending through cotton plug, and a trap at each end of bulb was formed by pressing the rubber connections firmly against the bottom and sides of test tubes, thus preventing the admission of air to broth contained in bulb. The cultures were incubated at 37° for twenty-four hours. The method used above is that advocated by Wright.

Digitized by Google

All media used in this investigation were made up as suggested by the American Public Health Association with the exception that six grams of Leibig's Extract were substituted for every 500 grams meat.

Data regarding the stage of river and air temperature were obtained from the offices of the Weather Bureau Service at New Orleans. The turbidity records at intake were secured from the records of the laboratory at Purification Plant.

Definition of Bacillus Coli.

The term *Bacillus coli* as defined in the report of the Committee on Standard Methods to the American Public Health Association signifies a group of organisms rather than the colon bacillus isolated by Escherich.

From the viewpoint of the water bacteriologist this definition has much significance; equal weight is then given to the members of this group as indicators of pollution in that they have the same habitat, the intestines of man, and that they possess the same vitality outside of the animal body.

The characters of a true *B. coli communis* can, according to Savage,[4] be reduced to the following: "A short bacillus with round ends, no spores, motile, decolorized by Gram's method, characteristic growth on gelatine, acid production and coagulation of litmus milk, production of indol, fermentation with production of both gas and acid in glucose and lactose media, no fermentation of starch or saccharose, a positive neutral red reaction."

The tests employed in this paper were similar to the above with the exception that the fermentation of saccharose was not observed as no attempt was made to distinguish between the non-saccharose fermenting *B. coli communis* and the saccharose fermenting organism *B. coli communior,* since for all practical purposes of water examination their sanitary significance is the same.

Estimation of B. Coli.

The method of estimating the number of *B. coli* adopted was that advocated by E. B. Phelps,[5] namely: "A positive

Digitized by Google

test in 10 c. c. not in 1 c. c. is considered to indicate the presence of 1 colon bacillus in 10 c. c., a positive test in 10 c. c. and 1 c. c., to indicate 1 colon bacillus per c. c."

Lactose Bile as Presumptive Test.

In routine analysis time would not ordinarily be available to run through the various confirmatory media that have been employed, therefore the extent that gas formation in lactose bile can be used as a presumptive test in the daily examination of the river water will be interesting.

Table 1 shows that from forty-five tubes that showed any gas at all within seventy-two hours, the colon bacillus was isolated thirty-nine times; that is, 80% were positive. This includes the nine atypical forms isolated that had all the characteristics excepting a positive neutral red reaction, but does not include the three forms that liquefied gelatine; for the purpose of this investigation these latter were regarded as not of the *coli* group at all. A longer series would show a larger per cent. of positive results because the larger part of the negative results were obtained in the beginning of experiment when lactose litmus agar plates were streaked.

A study of the percentage of gas formed shows that in tubes containing 1 c. c. and from which *B. coli* was isolated the average gas for twenty-four hours was 25%, with minimum amount of 0% and maximum limit of 60%; for forty-eight hours was 63%, varying from 45% to 80%, and for seventy-two hours, 65%, with limits 45% and 90%. In tubes containing 10 c. c. and from which *B. coli* was isolated but not from 1 c. c. of same sample the average amount of gas for twenty-four hours was 56%, varying between 30% and 90%; for forty-eight hours, 64%, with limits of 40% and 95%, and for seventy-two hours, 72%, varying from 60% to 95%. In tubes containing 10 c. c. of sample from 1 c. c. of which *B. coli* was isolated the average for twenty-four hours was 70%, varying from 30% to 100%; for forty-eight hours, 84%, varying from 55% to 100%; for seventy-two hours, 83%, with limits of 65% and 100%.

From the above we can say that as far as the data go the best period of incubation for a presumptive test would be forty-

Digitized by Google

TABLE I.

Date	Number	Raw	Grit Out	Coag. Int.	1st Coag. Out	2nd Coag. Out	Filt. Water	Tap	Temp. Water	Temp. Air	Turbidity	Stage of River	Per Cent. Gas Formed in Lactose Bile: 24 hrs. 1	24 hrs. 10	48 hrs. 1	48 hrs. 10	72 hrs. 1	72 hrs. 10	B. coli present in: Raw cc	Filt. cc
Dec. 3	1	400							55	58	370	4.3	5	80	45	100	45	100	1	
" 3	2			100																
" 3	3				18															
" 3	4						5						0	0	0	0	0	0		
" 3	5							7												
" 4	6	400							57	70	360	4.5	18	60	60	80	60	90	1	
" 4	7			110																
" 4	8				20															
" 4	9						4						0	0	0	0	0	5		
" 4	10							9												
" 6	11	600							65	64	314	4.2	0	45	30	70	70	75		
" 6	12			100																
" 6	13				20															
" 6	14						19						0	30	0	30	0	30		
" 6	15							23												
" 10	16	650							53	43	330	4.2	15	45	50	65	50	65	1	
" 10	17			77																
" 10	18				94															
" 10	19						83						0	0	0	45	0	50		
" 10	20							195					0							
" 11	21	560							53	56	295	4.2	5	50	40	70	50	70		
" 11	22			150																
" 11	23				63															
" 11	24						13						0	10	40	35	50	40		1
" 11	25							54												
" 12	26	620							51	43	300	4.3	0	30	60	100	90	100	1	
" 12	27			175																
" 12	28				55															
" 12	29						55						0	0	0	30	0	60		
" 12	30							120												
" 13	31	520							51	37	283	4.6	0	30			50	55	10	
" 13	32			125																
" 13	33				50															
" 13	34						23						0	0			0	50		
" 13	35							55												
" 16	36	500							51	44	257	4.1	0	40	65	80	65	85	1	
" 16	37			95																
" 16	38				23															
" 16	39						10						0	50	0	50	0	60		10
" 16	40							7												
" 16	41	350							51	64	241	4.3	25	70	65	85	65	80	1	
" 17	42			65																
" 17	43				30															
" 17	44						10													
" 17	45							50												
" 17	46	230							51	52	226	4.1								
" 18	47			95																
" 18	48				35															
" 18	49					30														
" 18	50						6													
" 18	51							3												
" 18	52	400							49	44	238	3.7		100		100		100	10	
" 19	53			52																
" 19	54				23															
" 19	55					23														
" 19	56						14													
" 19	57							40												
" 20	58	650							49	46	378	3.6								
" 20	59			80																
" 20	60				65															
" 20	61					20														
" 20	62						10													
" 20	63							65												
Jan. 3	64		780	150					44	41	301	3.5	10	55	50	75			1	
" 3	65				110															
" 3	66					90														
" 3	67						13													
" 3	68							40												
" 3	69												0	0	0	0				

Digitized by Google

TABLE I—CONTINUED.

DATE	Number	Raw	Grit Out	Coag. Int.	1st Coag. Out	2nd Coag. Out	Filt. Water	Tap	Temp. Water	Temp. Air	Turbidity	Stage of River	PER CENT. GAS FORMED IN LACTOSE BILE 24 hrs. 1	24 hrs. 10	48 hr4. 1	48 hr4. 10	72 hrs. 1	72 hrs. 10	B. Coli present in Raw cc	B. Coli present in Filt. cc
Jan. 6	70	160							55	68	234	4.4	35	50	65	55	70	55	1	
6	71		125																	
6	72			65																
6	73				50															
6	74					20														
6	75						10						0	0	0	0	0	0		
6	76							70												
8	77	350							47	41	238	4.2	0	30	0	40	0	80	10	
8	78		195																	
8	79			70																
8	80				50															
8	81					30														
8	82						8						0	0	0	0	0	0		
8	83							30												
10	84	260							47	54	221	4.0	0	30			5	60	10	
10	85		450																	
10	86			85																
10	87				60															
10	88					45														
10	89						8						0	0			0	0		
10	90							36												
13	91	200							48	45	224	4.4	20	35	55	55	55	60		
13	92		400																	
13	93			75																
13	94				35															
13	95					64														
13	96						9						0	0	0	0	0	0	0	
13	97							20												
14	98	320							48	46	287	4.5	0	85	20	95	20	95	10	
14	99		425																	
14	100			38																
14	101				35															
14	102					20														
14	103						25													
14	104							60					0	0	0	0	0	0		
17	105	600							50	63	511	7.4					27	62	1	
17	106		500																	
17	107			120																
17	108				42															
17	109					47														
17	110						13										0	5		*10
17	111							30												
20	112	890							48	631	300	10.3	35	75			70	90	1	
20	113		1100																	
20	114			70																
20	115				68															
20	116					44														
20	117						26						0	0	0	0	0	0		
20	118							30												
21	119	650							48	541	350	11.			65	85	65	85	1	
21	120		830																	
21	121			275																
21	122				45															
21	123					42														
21	124						6								0	0	0	0		
21	125							30												
27	126	1600							51	52	1533	13.9	5	68	70	85	85	80	1	
27	127		1270																	
27	128			190																
27	129				64															
27	130					63														
27	131						400						0	0	0	5	0	60	60	*10
27	132							350												
28	133	1050							50	42	1437	14.1	20	58	50	65	50	70	1	
28	134		890																	
28	135			250																
28	136				60															

* Indicates negative neutral red reaction.

Digitized by Google

TABLE I—CONTINUED.

DATE	Number	Raw	Grit Out	Coag. Int.	1st Coag. Out	2nd Coag. Out	Filt. Water	Tap	Temp. Water	Temp. Air	Turbidity	Stage of River	Per Cent. Gas Formed in Lactose Bile 24 hrs. 1	24 hrs. 10	48 hrs. 1	48 hrs. 10	72 hrs. 1	72 hrs. 10	B. Coli present in Raw cc	B. Coli present in Filt. cc
Jan. 28	137					55														
" 28	138						60						0	0	0	0	0	35	10	
" 28	139							125												
" 29	140	†							48	52	1437	14.2			60	65	65	65	1	
" 29	141		†																	
" 29	142			†																
" 29	143				†															
" 29	144					†									0	0	0	0		
" 29	145						†													
" 29	146							†												
Feb. 10	147	750							46	55	878	17.	0	60	0	70	0	55	*10	
" 10	148		340																	
" 10	149			87																
" 10	150				42															
" 10	151					95														
" 10	152						6						0	0	0	0	0	0		
" 10	153							4												
" 17	154	350							48	51	583	17.8	50	100	70	100	60	100	1	
" 17	155		340																	
" 17	156			122																
" 17	157				20															
" 17	158					17														
" 17	159						5						0	0	0	0	0	0		
" 17	160							32												
" 18	161	340							45	54	583	18.	0	70	0	80	0	80	10	
" 18	162		300																	
" 18	163			102																
" 18	164				25															
" 18	165					25														
" 18	166						8						0	0	0	0	0	7		
" 18	167							5												
" 19	168	400							45	58	547	18.3	35	100	75	90	75	85	1	
" 19	169		420																	
" 19	170			182																
" 19	171				32															
" 19	172					†														
" 19	173						35						0	40	0	42	0	65		*10
" 19	174							5												
" 20	175	280							47	56	603	18.3	5	60	10	65	30	75	10	
" 20	176		390																	
" 20	177			35																
" 20	178				20															
" 20	179					18														
" 20	180						4						0	0	0	0	0	0		
" 20	181							12												
" 21	182	420							46	56	547	18.3	0	90	0	85	0	80	10	
" 21	183		570																	
" 21	184			70																
" 21	185				24															
" 21	186					22														
" 21	187						10						0	0	0	0	0	0		
" 21	188							9												
" 24	189	260							46	54	520	18.1	0	100	5	90	10	90	*10	
" 24	190		300																	
" 24	191			130																
" 24	192				21															
" 24	193					26														
" 24	194						21						0	90	0	95	0	90		
" 24	195							9												
" 25	196	400							46	44	565	18.1	5	65	15	85	30	75	10	
" 25	197		500																	
" 25	198			55																
" 25	199				166															
" 25	200					280														
" 25	201						7						0	0	0	0	0	0		
" 25	202							3												
" 26	203	250							47	65	511	18.	60	95	80	92	75	95	1	

* Indicates negative neutral red reaction.
† Indicates plates not counted.

Digitized by Google

TABLE I—CONTINUED.

Date	Number	Raw	Grit Out	Codg. Int.	1st Coag. Out	2nd Coag. Out	Filt. Water	Tap	Temp. Water	Temp. Air	Turbidity	Stage of River	Per Cent. Gas Formed in Lactose Bile						B. Coli present in	
													24 hrs.		48 hrs.		72 hrs.		Raw	Filt.
													1	10	1	10	1	10	cc	cc
Feb. 26	204		210																	
" 26	205			85																
" 26	206				55															
" 26	207					25														
" 26	208						9						0	0	0	0	0	0		
" 26	209							100												
" 27	210	350							52	70	520	18.	15	100	67	85	80	75	1	
" 27	211		400																	
" 27	212			121																
" 27	213				130															
" 27	214					103														
" 27	215						400						0	0	0	0	0	0		
" 27	216							13												
" 27	217	280							51	58	479	1.7	0	80	0	80	0	75	10	
" 28	218		350																	
" 28	219			85																
" 28	220				42															
" 28	221					23														
" 28	222						7						0	0	0	0	0			
" 28	223							65												

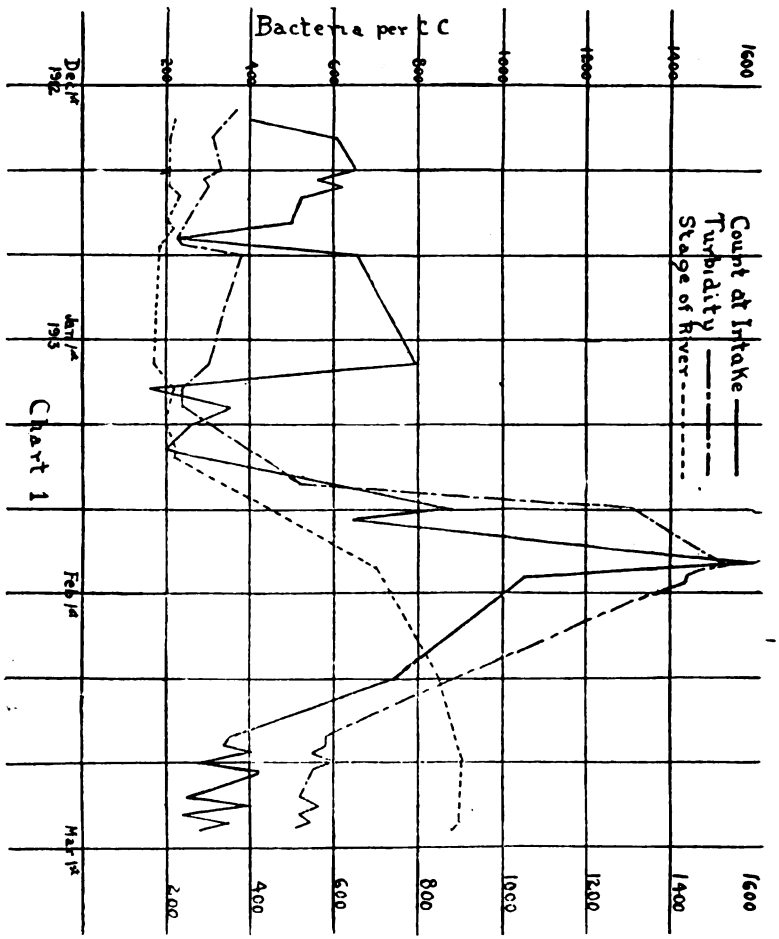
eight hours, because the average for 10 c. c. and 1 c. c. is more nearly equal then than at any other period and the range of gas percentages is not as variable as it is after twenty-four hours incubation. No particular advantage is gained by waiting seventy-two hours, except that sometimes gas is formed only after the second day, but the chances for its isolation are diminished, due to the predominance of other bacteria.

The averages for the tubes containing 10 c. c. of sample from 1 c. c. of which the colon bacillus was isolated are higher than that obtained ordinarily from the tubes containing 1 c. c. or 10 c. c. of sample in 1 c. c. of which the colon bacillus was not present. This, then, would indicate that, if in a long series of tests the gas production was between 70% and 85% after forty-eight hours incubation, there is a possibility that the colon bacillus would be found in a higher dilution of the water.

Discussion of Data.

During the month of January the rise of the river was fourteen feet and the opportunity of studying the river both at low and high water presented itself.

Digitized by Google



With all turbid waters there is generally thought to be a relation between the bacterial content and the turbidity. Chart I, plotted from the data obtained, shows the relation of turbidity to bacterial count to be fairly constant if the inaccuracies of plating be given consideration. A very interesting point, however, is that high water, contrary to popular opinion, does not ordinarily mean high bacterial count or increased turbidity. The chart shows graphically that it is only during the period when the water is rising that increased turbidity and counts

Digitized by Google

result and that when the water level is again stationary they are practically the same as at low water.

Before entering into a discussion of the raw water a sanitary survey of intake will be presented. The intake situated at the head of General Ogden street extends out 300 feet from the levee, but at low water a level stretch of land is uncovered that extends from base of levee to the intake. A gasoline launch plying between the two banks of the river has its landing just 100 feet upstream. This landing is a rendezvous for negroes, who congregate there to catch and cut driftwood. The possibility of pollution from the immediate vicinity is not constant during the entire year, for during low water it is readily understood how these negroes, in obeying the calls of nature, contaminate the flat area of land between the levee and river, which contamination in time of rising water is washed into river just above intake.

On the same bank, about 1000 and 2000 feet upstream, are located two wharves. The possibility of contamination from ships tying up at these wharves is very slight, for as told by the people in the immediate vicinity, a ship comes there about once a month and then stays just long enough to unload creosote at one wharf and take on a load of creosoted piles at the other. The effect of contamination by excreta deposited on the level stretch is not readily observed for two reasons. First, the dilution of contaminating material is very large; second, the increased count in river at the time of rising water overshadows any slight local pollution.

According to Whipple[6] "the best way to determine the presence of sewage in water is to actually find out whether or not sewage enters the water." The Mississippi River, that acts as an outlet for the sewage of 9,000,000 people, is undoubtedly contaminated. The nearest point of contamination is at Baton Rouge, a distance of 132 miles upstream. The question of interest to us here near its mouth is whether or not the effect of this contamination is able to be detected.

Much has been written about the self-purification of streams, and Mr. Weston's observations on the absence of *B. coli communis* from the Mississippi water at New Orleans have been

Digitized by Google

often quoted. It is generally believed in view of his work that the natural agencies are very favorable for the self-purification of the river in its last few hundred miles of travel. However, such is not the condition of the river at present. From Table I we see that the organism was isolated regularly in 1 c. c., occasionally in 10 c. c., and twice during rising period was isolated in one-tenth c. c. by Mr. Lemoine working in same laboratory. Therefore, when this germ has thus been shown to be consistently present in 1 c. c., we cannot assume that the river is as free from evidences of pollution as the experiments of twelve years ago has led us to believe. The flora of the water, however, with the exception of a yellow proteus form isolated, is that of a normal river containing many liquefying and fluorescent bacteria. Many liquefying and non-liquefying motile staphylococci were isolated. The non-chromogenic variety of the above have been isolated by Jordan from contaminated waters in greater numbers than in purer waters. The large proportion of this variety isolated here strengthens the findings of the *Bacillus coli*. The count as obtained on agar varied between 1600 as a maximum and 160 per c. c. as a minimum, with an average of 495.

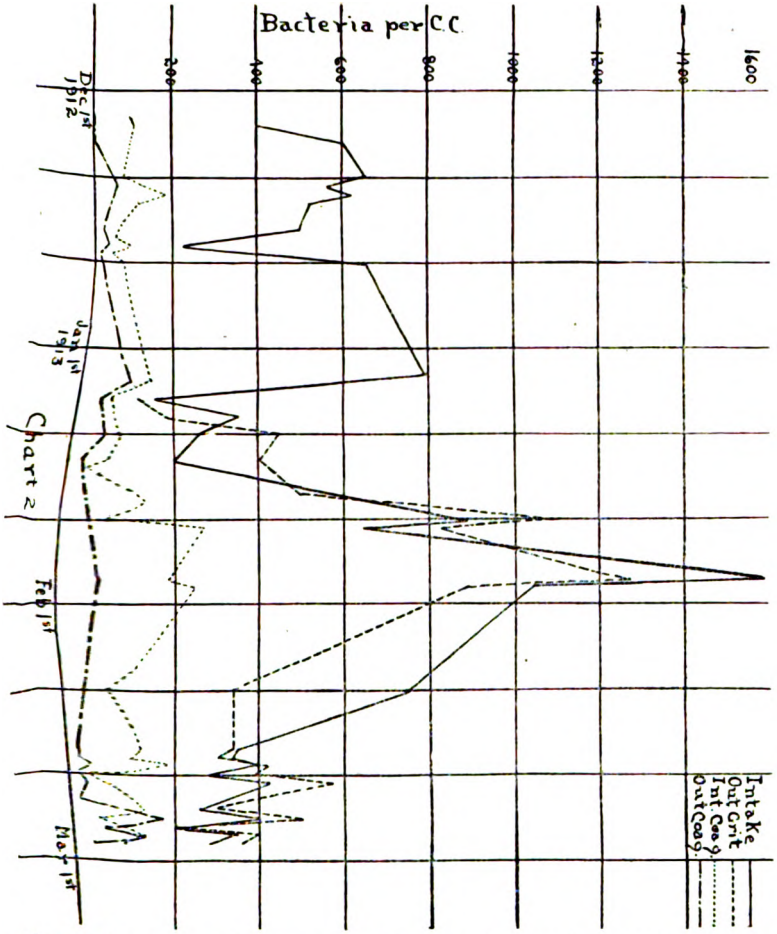
From a consideration of the above the normal water bacteria seem to have outgrown the sewage forms with the exception of *B. coli*, which persisted in only slightly diminished numbers.

Efficiency of Various Steps in Process.

Charts 2 and 3 show graphically the data in Table I. The variations in curves are obvious and the apparent lack of parallellism striking. However, we must consider that the bacterial flora consists chiefly of normal water forms, which find in the water sufficient food and with temperature favorable to their development, their growth is assured. So it is not surprising to find the number of bacteria at outlet of basins sometimes greater than at inlet.

In the beginning of investigation the grit reservoir was not in use, owing to low turbidity, and water was sent directly to the baffles. On January 6 the grit reservoir was put into service. The results as far as bacterial reduction is concerned are

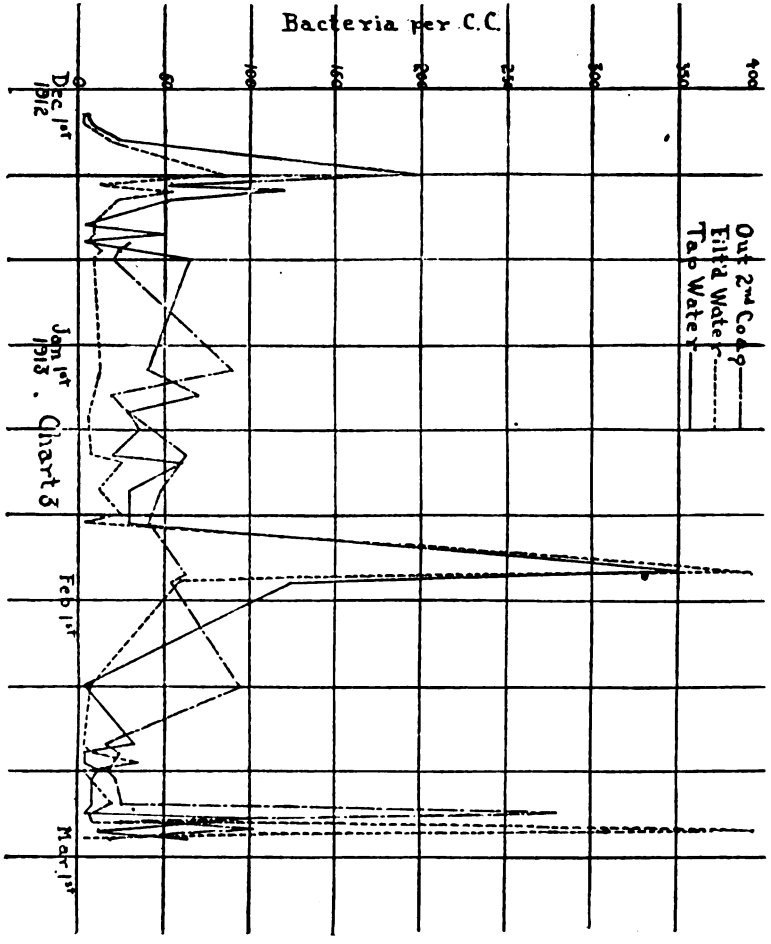
Digitized by Google



not constant; sometimes a decrease is observed and often there is an increase in number. The average for all counts for intake is 495 per c. c., and the average for counts at outlet of grit reservoir 491 per c. c., thus it is obvious that the bacterial reduction is negligible and cannot be relied on to give constant results.

The next point where samples were collected is as shown on ground plan of Purification Plant, at entrance to coagulating basin No. 4. The average for all counts taken here is 108 per c. c., and represents an average reduction of 78%. This intermediate step, that is, the lime and iron treatment, is

Digitized by Google



without doubt the most efficient in the whole process. The variations are from 48% to 91% removal. After allowing water to settle in coagulating basin No. 4, samples were taken at outlet. A count of 50 per c. c. represents the average number in water at this point, and reduction effected by coagulation is 54% of number introduced. The percentage reduction varied from 84% to 0%, and occasionally an increase in numbers.

In December, instead of conveying the water from coagulating basin No. 4 direct to filters, a gate was opened in wall sep-

Digitized by Google

arating coagulating basins 4 and 2, and water was given an increased period of sedimentation in coagulating basin No. 2 before filtering. To study the effect of this increased stay samples were taken at outlet of basin. The average for all samples taken is 51 per c. c., which does not differ from the average as obtained in coagulating basin No. 4; however, the separate reductions varied all the way from 60% decrease to an increase in numbers.

The samples of filtered water were taken in conduit leading to pump well, thus a sample of the combined effluent of all filters was obtained. The average of all samples, leaving out the peaks of curves as shown on Chart 3, is 17 per c. c. This represents an average reduction of 68%, with maximum of 97%, and occasional increase in numbers.

Samples were taken from a running tap in laboratory; the average count is 36 per c. c., the individual counts varying as shown on Chart 3.

Thus, to summarize the above, the averages obtained were as follows:

	Average Bacteria per c. c.
Intake	495
Grit outlet	491
Int. Coag. Basin No. 4	108
Out. Coag. Basin No. 4	50
Out. Coag. Basin No. 2	51
Filtered Water	17
Tap	36

The average efficiency of whole process for period observed was 96.5%, with a maximum and minimum limit of 99% and 91% respectively and neglecting the two occasions when count in filtered water was very high, the cause of which is taken up later.

The removal of 54% of bacterial content in the first coagulating basin as compared to practically no difference of count between the inlet and outlet of coagulating basin No. 2 calls for more careful consideration.

The factors generally believed to be pertinent to bacterial

Digitized by Google

reduction are: First, coagulating the microscopic clay particles and organic solids, thus forming particles of sufficient size that readily subside and render the water less suitable as a source of food supply for the organisms; second, in coagulating, the bacteria are enmeshed in the gelatinouslike precipitate which settles, thus removing bodily the bacteria from the water.

Admitting the influence of the water factors the writer believes that the greater part of the reduction during the flow through the baffles is due to the germicidal effect of the lime and that the coagulation and enmeshing of bacteria take place

TABLE II.

BACTERIAL EFFICIENCY—PER CENT.

No.	Grit	Baffles	1st Coag.	2nd Coag.	Filt.	System
1		75	82		72	99
2		73	82		80	99
3		83	80		5	97
4		88	Inc.		12	87
5		75	58		80	98
6		72	69		0	91
7		76	60		54	96
8		81	76		56	98
9		81	54		67	97
10		59	63	14	80	98
11		87	56	0	39	97
12		88	19	69	50	98
13		81	27	18	85	98
14	22	48	23	60	50	94
15	44	64	29	40	73	98
16	Inc.	81	29	25	82	97
17	"	81	53	Inc	86	96
18	"	91	1	43	Inc.	97
19	17	76	65	Inc.	72	98
20	Inc.	94	0	35	41	97
21	"	67	84	0	86	99
22	21	85	66	0	Inc.	75
23	15	72	76	1	"	94
24	55	74	52	Inc.	94	99
25	3	64	84	2	70	99
26	12	66	75	0	68	98
27	Inc.	57	82		Inc.	91
28	"	91	93	10	78	99
29	"	88	66	9	55	98
30	"	57	84	Inc	19	92
31	"	89	Inc.	"	97	99
32	16	60	35	55	64	96
33	Inc.	70	Inc.	26	Inc.	Inc.
34	"	76	51	45	70	98

Digitized by Google

in the coagulating basin, which probably explains the wholesale removal of bacteria in first coagulating basin as compared to the second.

The recent experiences of Mr. A. T. Nankivell[7] and others in softening contaminated chalk waters by the Clark process, show that the lime serves a double purpose, the softening of the water by the removal of the bicarbonate in solution and the sterilization of the water by its germicidal action.

As filters are always controlled bacteriologically, which consists of plating out samples two or more times a day and counting the colonies developing after twenty-four hours, care should be taken not to accept as positive an increased number of colonies as meaning that the filters are not working properly. Various experimenters have shown that sometimes the class of bacteria in the water being filtered is totally different from that found in the effluent which proves that down in the bottom sand layers and drains conditions are favorable for the growth of these harmless saprophytic bacteria.

The increased counts in filtered and tap waters as shown by peaks of curves, Chart 3, are due to the growth of two water organisms, which were isolated on various occasions. They were Eisenberg's *Bacillus liquidus* and a liquefying motile chromogenic (pink) coccus. These organisms were incubated in sterile tap water and grew well, thus demonstrating their ability to grow in filtered water.

Therefore, in view of these circumstances an erroneous idea may be obtained as to whether a filter is working properly or not if we are to use simply the count as the basis for judgment. Fortunately these organisms produce punctiform colonies on agar that are readily distinguishable from the other organisms growing on same plate. So in recording the count of these filters the record could be made more valuable by stating whether at time of increased count these punctiform colonies were present.

The presence of *B. coli* could be demonstrated in the filtered water six times, once in 1 c. c. and five times in 10 c. c. Larger volumes of water were not examined. The presence of this organism in filtered water is due most likely to the

Digitized by Google

fact that when the water gets an overdose of lime an attempt is made to correct it by adding raw water on top of the filters. If the overdose is observed in time the correction is preferably made by adding raw water at end of division wall in coagulating basin.

A pure and sanitary effluent is desirable at all times and under all conditions of variation in the raw water, therefore to insure this, complete daily bacteriological determinations are made.

According to our present knowledge the disappearance of *B. coli* more nearly indicates the fate of *B. typhosus* in water than any other organism. Any method adopted to determine whether or not a satisfactory removal of objectionable organisms is obtained, must include the search for and isolation of *B. coli.*

The bacteriological work carried on at the plant includes counts made twice from each basin and separate filter effluents, together with a determination of *B. coli* in 1 and 10 c. c. of raw water and in 10 c. c. of filtered water.

The determination of *B. coli* is made as follows: The water is put into lactose bile tubes, which are incubated at 37° for twenty-four hours; if gas is observed at the end of that time a loopful is transferred to each of the following media: liver broth and lactose bile, which are then incubated at 37° for twenty-four hours. If gas is observed in both within forty-eight hours' incubation, a lactose litmus agar plate is made from the bile tube, the development of red colonies thereon within twenty-four hours at 37° indicates the presence of *B. coli.*

In view of the writer's present investigation, much time can be saved by omitting the inoculation of liver broth and the re-inoculation of lactose bile. The writer found that from forty lactose litmus plates that showed red colonies the *B. coli* was isolated thirty-nine times, therefore a plating of lactose litmus agar direct from the first lactose bile tube can be depended upon to give quite accurate results and thus save time taht can be more profitably employed. The writer would suggest also that the plates be poured as given under his technique and not streaked, because the overgrowth would necessitate recording

Digitized by Google

negative result or some extra work in obtaining a pure culture by passing it through another tube of bile and then replating. The time saved could be very advantageously spent in more careful plating of samples from basins and filters. The writer appreciates that in routine work there is need of an expeditious procedure; however, this must not be obtained at the expense of accuracy.

A smaller dilution of raw water, grit reservoir and coagulating basin would necessitate increased time spent in counting, but would increase the accuracy of work in like proportion. By more careful plating and manipulation plates lost due to overgrowth could be reduced and records obtained that would be more continuous and trustworthy.

In criticism of the method employed it can be said that the main fault is a lack of judicious distribution of time between the various determinations. A correction of this as suggested would not affect in any way the accuracy of the coli determinations, but would increase the value and accuracy of the counts, which, even though made by exercising the greatest care in technique, are at best relative.

While it cannot be said that the methods employed give a false sense of safety, it is desirable to have the records as accurate as the methods allow, therefore the change is necessary in order that the water have the careful and accurate evidence of its purity which it so justly deserves.

Relation of Mississippi River to Typhoid Fever.

Tables 3 and 4 were compiled from the Biannual Reports of the City Board of Health of New Orleans.[8] Typhoid fever was made a reportable disease in the year 1901. The statistics for 1902 and 1903 are not complete and were left out of the tables.

While it is not the purpose of this investigation to study the cause and prevalence of typhoid fever in New Orleans, it is, however, within the scope of this paper to determine the relation between the improvement in the water supply and the typhoid death rate.

In the history of New Orleans there has never been an epidemic traceable to the water supply. In fact, there has been

Digitized by Google

TABLE III.

Typhoid Statistics.

Year	Cases			Deaths			Per Cent. Cases Terminated by Death		
	White	Colored	Total	White	Colored	Total	White	Colored	Total
1904	275	60	336	85	26	111	30.8	43.3	33.1
1905	283	52	335	82	19	101	29.0	36.6	30.2
1906	362	59	421	71	24	95	19.6	40.7	22.6
1907	758	189	947	115	64	179	15.2	33.9	18.9
1908	411	107	518	72	36	108	17.5	33.6	20.9
1909	480	83	563	76	20	96	15.8	24.1	17.0
1910	322	83	405	65	42	107	20.2	50.6	26.4
1911	345	96	441	58	48	106	16.8	50.	24.0

TABLE IV.

Typhoid Statistics.

Year	Population			Death Rate per 100,000			Morbidity Rate per 1000		
	White	Colored	Total	White	Colored	Total	White	Colored	Total
1904	239,000	86,000	325,000	35.6	30.2	34.2	1.15	.7	1.03
1905	245,000	88,000	333,000	33.5	21.6	30.3	1.15	.59	1.00
1906	251,000	90,000	341,000	28.3	26.7	27.9	1.44	.65	1.23
1907	258,000	93,000	351,000	44.6	68.8	51.0	2.94	2.03	2.7
1908	265,000	97,000	362,000	27.2	37.2	29.8	1.55	1.1	1.43
1909	272,000	101,000	373,000	27.9	19.8	25.7	1.76	.82	1.51
1910	279,000	105,000	384,000	23.3	40.0	27.9	1.15	.79	1.05
1911	286,000	109,000	395,000	20.3	44.0	26.9	1.21	.88	1.13

no thorough digest of the typhoid fever situation. An analysis of the data shows that with the exception of the year 1907 the total typhoid death rate has not varied much within the last eight years.

The curves on Chart 4 representing the rise and fall of the monthly averages of cases and deaths for the last eight years, do not show any sudden rise that might be attributed to a general infection from some such widely used agent as water. The individual years as seen in Tables 5 and 6 are as free from sudden rises as in the average curve plotted. Sedgwick and Winslow are credited with saying that "in cities having pure water sup-

Digitized by Google

TABLE V.

Typhoid Deaths by Years and Months.

Year	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
1904	9	7	2	6	10	13	11	14	12	10	10	7
1905	11	2	8	6	6	11	28	13	5	3	5	3
1906	4	4	4	6	6	8	20	12	11	5	7	8
1907	8	14	5	8	19	19	23	27	19	14	12	11
1908	7	4	4	4	10	9	9	15	7	13	17	9
1909	11	8	7	5	6	9	8	9	8	9	6	10
1910	5	8	7	7	5	13	12	13	14	9	7	7
1911	6	3	11	2	9	16	17	14	6	10	6	6
Total	61	50	48	44	71	98	128	117	82	73	70	61
Average	7.6	6.2	6.	5.5	8.9	12.2	16	14.6	10.2	9.1	8.8	7.6

TABLE VI.

Typhoid Cases by the Years and Months.

Year	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
1904	16	15	8	18	28	28	45	58	37	26	26	31
1905	32	7	16	26	19	24	114	31	27	12	16	11
1906	12	8	9	9	21	40	65	71	44	69	35	38
1907	45	36	20	37	76	105	175	124	116	108	62	43
1908	33	8	18	24	38	61	74	73	36	70	52	31
1909	60	33	46	26	32	59	56	59	46	41	49	56
1910	27	25	17	22	23	52	52	48	43	31	43	22
1911	22	8	30	35	35	82	78	50	35	39	14	13
Total	247	140	164	197	272	451	659	514	384	396	297	245
Average	31	17.5	20.5	24.6	34	56.4	82.4	64.2	48	49.5	37.	30.

plies the annual curve of typhoid fever mortality closely follows that of annual temperature." This is most readily observed where a city using a supply known to be polluted and having a typhoid mortality curve which is characterized by peaks due to outbreaks caused by the contaminated water, installs a filtration

Digitized by Google

plant which has the effect of preventing these outbreaks and allows typhoid to be spread by the other agencies. The death rate due to typhoid will then assume a variation approximating that of annual temperature.

The curves (Chart 4) follow the rise and fall of the annual temperature. However, for a seasonal distribution of typhoid

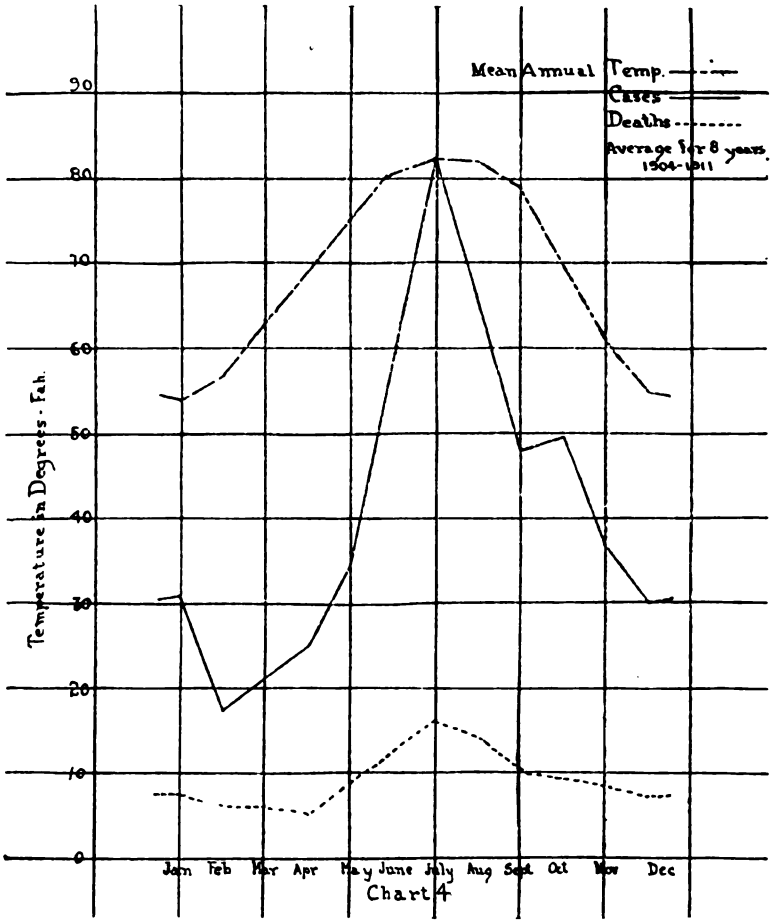


Chart 4

fever the number of deaths in the winter months is rather large as compared to those of summer months.

From the above it would seem that water was never a large

Digitized by Google

factor in the prevalence of typhoid in this city. The facts supporting this view are: the lack of outbreaks and the limited extent of the use of unfiltered water. The maority used cisterns, which, as previously stated, were not liable to contamination of this kind. The relative purity of the raw water in earlier years as shown by Mr. Weston's experiments, is another factor that must be considered as tending to disprove any claims that typhoid was water borne.

On the other hand, however, the pollution may have been so dilute that its ability to cause disease was not noticed in a widespread epidemic, but it possibly claimed numerous victims through its subtle influence.

Like most Southern cities of any size, New Orleans is burdened with a large negro population whose habits of living and liability to infection from contact and filth are well appreciated. Because of the high colored typhoid rate for the last two years, New Orleans has been unable to show an appreciable reduction in the typhoid death rate. If, however, the white rate be taken to show the actual improvement in conditions, then it can be said that since 1904, with the exception of the year 1907, there has been a steady decrease in the typhoid death rate.

This decrease has been coincident with the improvement of general sanitary conditions, as drainage, installation of sewerage line and the substitution of a general distribution system of pure water for the somewhat restricted distribution of water of a questionable purity whose victims served as foci for the furtherance of the disease by contact and other agencies.

Conclusions.

From the facts and arguments embodied in the paper the writer draws the following conclusions:

1. The Mississippi River has increased in pollution since the investigation of Mr. R. S. Weston in 1901. The widely adopted belief that the river at New Orleans is still free from pollution should be corrected.

2. In spite of the increased pollution of the river the effluent of the filters is of good sanitary quality.

Digitized by Google

3. The introduction of water purification plant was not followed by an observable decrease in typhoid rate.

4. In justice to the quality of the water the routine examinations should be carried out with greater care, so that the water will have the substantial evidence of bacteriological data carefully obtained.

The following organisms were isolated from the Mississippi River at New Orleans. The grouping is arranged according to Jordan.

Organism.	Group.	Investigator.
B. coli	I	(Escherich)
Yellow Proteus Form	III	
Ps. fluorescens	V	(Flugge) Migula
B. gangliforme	VII	(Ravenel)
B. dendriticus	VII	Lustig
B. vermiculare	VII	(Frankland)
B. New Orleans No. 7	VII	Weston & Kendall
B. subtilis	VII	(Ehrenberg) Cohn
B. cereus	VII	(Frankland)
B. formosus	VIII	Ravenel
Ps. liquida	VIII	(Frankland)
B. liquefaciens	VIII	(Frankland)
B. arborescens	X	Ravenel
B. New Orleans No. 6	XII	Weston & Kendall
Chrom. Cocci		
Gel. liquefied	XIV	
Non. Chrom. Cocci		
Gel. Liquified	XV	
Gel. not Liquified	XV	

References.

1. Report on Water and Sewerage, New Orleans, 1903. R. S. Weston.
2. Report on Water Supply of New Orleans to National Board of Health. Bull. 1880, Vol. I, No. 42.
3. Standard Methods of Water Analysis, A. P. H. A., 1912.
4. Water Supplies. Savage.
5. A. P. H. A., Vol. 33, 1907, part 2, pp. 9-13. E. B. Phelps.
6. Water Supply, Paper 194, U. S. Geological Survey.
7. Journal Hygiene, Vol. XI, 6911. A. T. Mankivell.
8. Biennial Report of City Board of Health, 1904-1911. Semi-annual Reports Sewerage and Water Board.

Digitized by Google

THE AMERICAN SOCIETY OF TROPICAL MEDICINE

In a letter to the Editor of this JOURNAL, Capt. Henry J. Nicholls, M. D., U. S. A., writes as follows: "If you would allow a suggestion, it might be well, occasionally at least, to publish a list of the officers of the American Society of Tropical Medicine, with the address of the Secretary, so that the existence of the Society will be kept before the attention of possible members." In accordance with this desire we print below the roster for the current year:

Elected at the Annual Meeting, May 8, 1912.

Officers, 1913-1914.

President.

Richard P. Strong, M. D., Boston.

Vice Presidents.

Creighton Wellman, M. D., New Orleans.
Charles F. Craig, M. D., Fort Leavenworth, Kansas.

Treasurer.

Joseph D. Weis, M. D., New Orleans.

Secretary.

John M. Swan, M. D., Rochester.

Assistant Secretary.

Allen J. Smith, M. D., Philadelphia.

Councillors.

(To Serve One Year)

Henry J. Nicholls, M. D., Washington.
Roger S. Morris, M. D., Clifton Springs, New York.
Seale Harris, M. D., Mobile.

(To Serve Two Years)

C. C. Bass, M. D., New Orleans.
Joseph H. White, M. D., New Orleans.

Communications concerning the Society should be sent to the Secretary, Dr. John M. Swan, 457 Park Avenue, Rochester, New York, U. S. A., or to the Assistant Secretary, Dr. Allen J. Smith, Medical School, University of Pennsylvania, Philadelphia, Pa., U. S. A.

Digitized by Google

THE LISTER MEMORIALS.

The JOURNAL has received the following communication and enclosure, which are self-explanatory:

THE AMERICAN SOCIETY OF TROPICAL MEDICINE
457 Park Avenue
Rochester, N. Y., U. S. A.

Office of the Secretary
John M. Swan, M. D.

To the Members of the American Society of Tropical Medicine:

The Secretary has received the accompanying letter from Dr. W. W. Keen. It seems to him that the medical profession in the United States ought to subscribe at least $1000 to this memorial. Certainly the work of Lister has made medical practice in tropical and subtropical countries less irksome and productive of much benefit to the inhabitants of these countries. If any member of the American Society of Tropical Medicine feels that he can contribute to this fund, he should send his subscription to Dr. Keen as soon as possible.

JOHN M. SWAN,
Secretary.

1729 Chestnut Street, Philadelphia, Oct. 4th, 1913.

My Dear Dr. Swan:

In response to your letter of August 9th, I have looked over my accounts and find that I paid my dues to the American Society of Tropical Medicine on January 17th, 1913.

As to the Lister Memorials, I feel very anxious that something shall be done to make our American contribution to these various memorials satisfactory as showing the appreciation of the profession of the magnificent work of Lister. Thus far I have received less than $1000. Over $800 of this amount I forwarded last spring to London and Glasgow. I am taking up the matter again now. I should be very much obliged to you if you could make an appeal to your various members, either by a circular or by a manifold letter, for contributions to be sent immediately, so that we can close up the matter before the end of this year.

Yours very truly,
W. W. KEEN.

Digitized by Google

NEWS AND COMMENT

The Commission of the Southern Medical Association for the Study and Prevention of Malaria will meet in Lexington, Ky., on November 17.

The Government of Cuba will establish for the island forty new hospitals, the expenses of which are to be provided from the Government Lottery Fund.

Captain Charles F. Craig, Medical Corps, U. S. A., has been transferred from the Army Medical School, Washington, D. C., to Fort Leavenworth, Kansas.

The Mississippi Valley Medical Association will meet in New Orleans October 23-25. Several interesting papers on social hygiene are announced in the preliminary program.

Colonel Gorgas, Chief Sanitary Officer of the Panama Canal Zone, has been invited by the Johannesburg Chamber of Mines to visit South Africa, to study sanitary conditions in the Rand mines.

A movement is on foot in Great Britain looking toward the coöperation of the Rockefeller Sanitary Commission and the British Medical Societies for purposes of tropical research and sanitary measures directed against tropical diseases.

Harvard University and the Massachusetts Institute of Technology have established in coöperation a school for health officers. Both medical and non-medical men will be admitted. On completion of the course a Certificate of Public Health will be granted.

It is reported that fifty cases of pellagra in England have been recently diagnosed and investigated. Sambon is quoted as regarding these as evidence against the maize origin of the

Digitized by Google

disease, this cereal being very sparingly consumed in Great Britain.

On November 17, as a part of the work of the Section on Hygiene and Preventive Medicine of the Southern Medical Association, a conference of Southern public health officials will be held. Among the subjects discussed will be malaria; pellagra; the negro in relation to public health; milk; and vital statistics.

It was announced at the recent meetings of the California State Board of Health that nine counties of that State harbor plague-infected squirrels. Active measures on the part of the Federal Government and the State looking toward rodent extermination are now in progress. Last year $186,733 were expended for this purpose.

A new laboratory with accommodation for sixty students, as well as dormitory provision for twenty-five residents, has been added to the London School of Tropical Medicine. A new course in Tropical Sanitation and Hygiene has been added to the curriculum of the School. This course will consist of eight weeks' laboratory and practical work.

Dr. Salanoue-Ipin, a member of the Société de Pathologie Exotique, of Paris, died at Hué on June 24. He had been director of the health service of Annam for several months. He was the author of Studies of Vaccine in the Sudan, Studies on Malaria at Tonkin, Studies on Beri-beri, and a Compendium of Tropical Pathology.

On September 11, 1913, Surg. Currie, of the Public Health Service, reported a fatal case of plague at the Martinez Hospital, Contra Costa County, California. The patient was a white man, 55 years old, entered the hospital September 8, and died on September 11, 1913. He was employed on a ranch at Pittsburg, Contra Costa County, having been there for the past two years.

Dr. Robert E. Swigart, General Superintendent of the Medical Department of the United Fruit Company, has gone to Boston

Digitized by Google

to take charge of the Department from there. Dr. Swigart has been for some time Professor of Tropical Sanitation in the Tulane School of Tropical Medicine and Hygiene, a position for which he was particularly suited, having spent much time in the Tropics. Dr. P. E. Murphy will succeed Dr. Swigart in New Orleans.

On September 12, a jury rendered a verdict for $1000 against the G. & S. I. Ry. Co. for giving pellagra to the daughter of the plaintiff in a rather peculiar manner. A horse was killed by the train and buried six feet deep in stiff clay a distance of 281 feet from the plaintiff's well. It was indicated by the evidence that the horse had corn in his stomach when killed, and that it spoiled and leaked out into the soil, from which it was carried to the well and thereby gave pellagra to those who drank it. This spoiled corn was proven to be the cause of pellagra in a court trial and to the satisfaction of the jury, while the advocates of the corn toxin theory have been unable to prove it in a hundred years.*

Dr. L. W. Sambon is on a visit to this country in further pursuance of several years of study of pellagra. On September 3 there was a gathering at Spartanburg, S. C., of about 200 physicians of this country who are especially interested in the disease, to meet Dr. Sambon and hear his views. It will be recalled that he has expressed the opinion that the disease is infectious and is probably transmitted by the *Simulium*. One would hesitate to doubt the correctness of his opinion if it be remembered that it was he who announced his opinion that sleeping sickness was infectious and transmitted by the tsetse fly long in advance of the discovery of the trypanosome as the real cause of the disease. It would be interesting to know, however, what he thinks after he has verified the report of the prevalence of pellagra in parts of Texas more than 50 miles from any running stream or possible breeding place for *Simulium*. This was first reported by K. H. Beall, and to the writer's

*We doubt whether any Supreme Court would ever affirm such a decision. It reads like a hoax. ED.

Digitized by Google

personal knowledge has been confirmed by two perfectly competent entomologists.

A personal communication to the Editor from Dr. Maurice B. Mitzmain of the Research Laboratory at Alabang, Rizal, Philippine Islands, bears the following interesting news. Dr. Mitzmain has succeeded in eliminating *Stomoxys calcitrans* as a practical factor in surra transmission and incriminates the common horsefly of the island, *Tabanus striatus*. In addition to these he has used the following flies in transmission experiments with negative results: *Philoematoyia* sp., *Culex fatigans* and *Stegomyia fasciata*. All of these are numerous at some season of the year and widely distributed throughout the archipelago. The mosquitoes, in addition to *Hippobosca* and *Stomoxys* have been investigated for a possible developmental cycle of *Tr. evansi*. As for the treatment of surra, Dr. Mitzmain is trying, without any great success, the arsenic treatment of Holmes of India, but considers that this treatment in its present form will never be popular, as the danger and occurrence of arsenical poisoning are great. In the matter of prevention, he is in a position to make a practical recommendation to alleviate local conditions. The principle, of course, is to keep stock and the guilty fly (*T. striatus*) from coming together, as no practical solution for fly destruction has been reached. *Tabanus striatus* will bite only animals kept in the open and infestation is prevented by keeping animals in darkened stables or under open sheds with the eaves produced as low as possible. The local breeding places of this fly have been recently discovered and if the problem is not too gigantic it is barely possible that control measures regarding the larval stage may be effected.

At the meeting of the Société de Pathologie Exotique, of Paris, held on July 9, the following resolutions concerning the opium traffic were unanimously adopted:

1. That the public ministers take the necessary measures to prevent the extension of the use of opium in France and to destroy in the well-defined surroundings where it has been established the foci already existing.
2. That the use of opium be interdicted to all the military

Digitized by Google

and naval officers in France and in the colonies under penalty of discipline.

3. That the government of Indo China make the necessary arrangements for the gradual suppression of the sale of opium in proportion as this suspension can be realized in the surrounding country.

4. That the government of Indo China complete and develop as rapidly as possible the measures that it has already undertaken, notably:

(a) The prevention of smokers from assuming public functions and from being advanced to the rank of mandarin;

(b) Making known the dangers of opium by academic and public instruction;

(c) The organization of hospitals for the treatment of opium users who wish to give up their fatal habit.

5. That the colonial governors make the necessary arrangements so that cocaine, morphine, alkaloids derived from opium, as well as medicines called "anti-opium," can be delivered by the customs service only to European pharmacists. These pharmacists shall be required to inscribe the receipt and disbursement of these medicines in a special register which shall be submitted to inspection.

Digitized by Google

CURRENT LITERATURE

Preliminary Note on a New Flagellate, Crithidia Hyalommae, Sp. Nov., Found in the Tick Hyalomma Aegytium (Linnaeus, 1758).—(Jour. Trop. Med., 1913, xvi, 245.) W. R. O'Farrell of Khartoum describes a flagellate parasite of the common cattle tick of the Anglo-Egyptian Sudan. The adult parasites are unusually long and slender for *Crithidia*, measuring from 26 to 40 μ in length, including the flagellum. The average breadth is 2.5 μ. The undulating membrane is well marked. The nucleus is round or oval and generally lies at about the middle of the body, occupying nearly its whole breadth. The blepharoplast is usually situated in the flagellar side of the nucleus.

John M. Swan.

Ulcerous Colitis Due to Lamblia intestinalis. Perforation. Death. (Archives des maladies de l'appareil digestif et de la nutrition. Juin, 1913.) G. Fairise and C. Jacquot report the case of a male, 39 years, who presented, while in Tonkin, a dysenteriform affection of short duration. Three years after his return to France he complained, without apparent cause, of intestinal disorders, characterized by an intense and obstinate diarrhea. These disorders had lasted twelve years when he suddenly showed signs of peritonitis and died. Post mortem findings were old and recent lesions of peritonitis and chronic ulcerous colitis. The morbid anatomical changes were similar to those of amebic dysentery. The parasites, which were numerous, presented all of the characteristic morphology of *Lamblia intestinalis*.

E. M. Dupaquier.

A New Human Parasite, Agchylostoma ceylanicum.—(Indian Med. Gaz., June, 1913, Vol. xlviii, No. 6, pp. 217-218. With one plate.) Clayton Lane reports the presence of *A. ceylanicum* in three of thirty stools secured from the prisoners of the Mymensing jail. This species was formerly thought to be a parasite of the civet cat of Ceylon only, but Lane also reports it as being common in the dogs and cats of Berhampore, Bengal. It was also found in an African lion born in the Calcutta Zoo. Those infecting the prisoners were found to be longer than those of the cat, they averaging 8.5 mm. for the males and 10.5 mm. for the females, while those of the cat average 5 mm. and 7 mm. The chief specific characters are given thus: "Two pairs of ventral marginal teeth; when the mouth is looked into from without the one pair is deep and cephalad, and the other superficial and caudad. The points of both pairs are directed caudad. The bursa of the male has

Digitized by Google

marked clefts dividing the dorsal from the lateral lobes; the dorsal ray bifurcates, and each branch again bifurcates, while the edge of the dorsal lobe of the bursa has a single convex curve on each side of the midline, the two curves producing an outline like that of a weak figure 3. The lateral lobe is rather long and rounded." The author discusses the probable future complexity in dealing with this parasite as regards the prophylaxis of ankylostomiasis should any clinical significance result from its presence in man.

P. L. Querens.

A Review of a Clinical Study of Malarial Fever in Panama. IV, Relapse in Malaria.—(Jour. Trop. Med., 1913, xvi, 241.) According to John Pelham Bates' observations relapses in malaria are so frequent that they may be considered a syndrome of malarial disease. He has had a few cases under observation from time to time in which reinfection could be eliminated. In the majority of these the recurrences ceased after the third or fourth attack. Relapses are most troublesome and persistent in children and in adults whose duties force them out too quickly after the subsidence of the fever. He criticises the work of Rowley-Lawson; the theory of intracorpuscular conjugation of the plasmodia, first put forth by Mannaberg and later advocated by Craig; and the theory of parthenogenesis originally advocated by Schaudinn, all unfavorably. He takes the view that relapses are due to residual parasites, too few to be detected in the blood, which continue to reproduce themselves in the usual asexual cycle. They are held in abeyance for a time by the immunity principles of the blood and the phagocytic properties of the leucocytes. When circumstances are favorable to the parasites, from some breaking of the advantage held by the host, they multiply to numbers sufficient to reproduce the symptoms of the original attack. He quotes some work of Darling's to support this view. He does not appear to have any more conclusive evidence to support his views than those who advocate parthenogenesis, or corpuscular conjugation. He does not believe that attacks of malaria which occur three, five, or thirteen years after an original infection are relapses.

John M. Swan.

A Year's Anti-malarial Work at Khartoum.—(Jour. Trop. Med., 1913, xvi, 226.) Andrew Balfour contributes an article on the anti-malarial work done in and about Khartoum in 1912. During the year 1912 Khartoum and North Khartoum had a civil population of 43,210. The rainfall amounted to 116.2 millimeters; 0.4 mm. in July, 98.1 mm. in August, and 17.7 mm. in September. During the other nine months there was no rainfall. Eighty-seven cases of locally acquired primary malaria were notified throughout the year; the largest number, 44, being reported after the heavy August rainfall. There were no deaths among these cases. There was a large number of imported caess, and

Digitized by Google

these and the carrier cases doubtless played an important rôle as reservoirs of the virus. The only fatal case of malaria reported during the year was one that had originated outside of Khartoum. An effort was made to give all infected sailors and employees in the steamer department a full three months' treatment with quinine. The cases were all quartan or malignant. No benign tertian cases were seen and the majority were due to *Plasmodium falciparum*. *Pyretophorus costalis* is the chief malaria mosquito about Khartoum. The sex can be diagnosticated in the larvae; the male has a brownish, oval tumidity, which represents the testis and sac, on either side of the sixth abdominal segment. In 1912 trains were for the first time found to be operative on a considerable scale as mosquito vectors. In regard to immigration, Balfour is in general accord with Ross's dictum that, as a general rule, if the area of (mosquito) operations is of any considerable size, immigration will not very materially affect the result. At Khartoum, however, the problem is complicated by steamers, boats, and possibly by trains. Moreover, the pools along the Nile form a chain of breeding places which makes it impossible to get at the distal ends. He agrees with Melville that no matter how energetic and systematic a sanitary officer may be, he need never hope to eliminate all the malaria-bearing mosquitoes from his station. A station can be malaria free without being mosquito free. So far as Khartoum is concerned, the cordon will be pierced every now and then. Petroleum has its limitations as a larvacide, as the wind blows it aside, leaving an untreated water surface on which mosquitoes readily lay their eggs. He uses sanitas-okol, izo-izal, and creosote. Izo-izal kills or renders the larvae of *Pyretopherous costalis* moribund in one-half hour in a dilution of 1 to 30,000. In a dilution of 1 to 40,000 it is effective in an hour and one-half. Sanitas-okol is just as effective and is cheaper. For the disinfection of cabins and holds of steamers he uses cresyl fumigation. He lays stress on the danger of irrigated areas as "attraction centers." The article is illustrated by a complete map. J. M. S.

The Culture of Malaria Parasites by Bass's Method.—(Archiv für Schiffs u. Tropen-Hygiene. Bd. 17, Heft. 16, 1913.) H. da Rocha-Lima and H. Werner, Hamburg, have known for some years that the development of malaria parasites *in vitro* was a possibility, through verbal communications from Prof. Nocht, who had repeatedly observed the production of schizonts. These never went as far as the sporulation stage. Nocht had never considered his observations of sufficient importance to publish, and conceived the enormous numbers of tropical forms in the capillaries of cadavers as being due to port mortem phenomena. The authors found difficulty in confirming Bass's results until the appearance of a detailed account of the technic in September, 1913, in the Journal of Experimental Medicine. The authors have experimented with eleven tropical and six tertian cases, using Bass's

Digitized by Google

technic. Several cases where certain changes in the technic were made are not recorded. They noted that subsequent development of tertian was more difficult than the tropical, as Bass had found it to be. Considering the results obtained, the authors find that they can follow the development of both tropical and tertian schizonts to sporulation. The lack of dextrose and room temperature were decided disadvantages, and they could confirm Bass's statements that the addition of dextrose assisted greatly the development *in vitro*, through the sporulation stages. This was controlled not only by morphological changes, but also by increase in numbers. Cultures of the tropical parasites which had stood more than 48 hours in the incubator showed besides division forms old pigmented plate forms. They found here and there endoglobular non-pigmented forms. The latter are probably due to slower or retarded development of the schizonts in the culture tubes. The cycle requiring 48 hours in the human body is not held to in culture tubes. The endoglobular ring forms could often be seen 24-48 hours after taking the blood sample. A tendency to remain at one stage of division was shown by both tertian and tropical parasites. Especially was this the case when dextrose was left out and cultures allowed to stand at room temperature. These phenomena of the development of the parasites *in vitro* have also been observed by Bass, T. G. and D. Thomson, and Ziemann, who concluded that several new generations of schizonts were formed. Unfortunately all accurate data which could confirm the idea of repeated sporulation fail entirely in these authors' articles. Certain proof that a new generation of schizonts, i. e., a further development of schizonts through the sporulation stage, has up to the present not been produced. Neither could the observations of the authors confirm the supposition that schizonts were found *in vitro* beyond the stage of sporulation. While the results of the investigations were in general in accordance with those of Bass, the Thomsons and Ziemann, the authors differ in the interpretation. A criterion which, taken in conjunction with the morphological characteristics, carries weight in judging the success of cultivation methods, is the parasite count. The difficulties met with here are great. The number of leucocytes in preparations taken direct from the cases are of no value. To determine the relation of the number of erythrocytes to parasites is difficult and not satisfactory, moreover there was a decided tendency of infected erythrocytes to agglutinate. Authors had the impression that there was a decrease in the number of parasites after taking the blood sample and that this rapidly diminished even to disappearance after the first sporulation. The authors conclude: That it was not possible for them to confirm the results of Bass relative to the culture of malaria parasites, but that Bass's technic was of advantage for the development of one generation of schizonts. The authors could find in the majority of the fifteen cases of malaria that Bass's method allowed them to follow the development of the schizonts

Digitized by Google

to division. Beyond this stage new schizont division was not noted. Those forms which they did see after this division, they concluded were due to retarded schizogony and not as Bass, Ziemann and Thomson thought, due to second and third sporulation. A proof that there was an increase in the numbers could not be brought. The apparent increase in numbers was probably due to agglutination of infected erythrocytes. Especially noteworthy from a morphological standpoint was the bleached appearance of erythrocytes which had been attacked by tropical schizonts and a premature clumping of the pigment during schizogony of the tropical parasite, even before division had been completed.

Leonard C. Scott.

Digitized by Google

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed.

BOOKS.

Manual of Tropical Medicine. By Aldo Castellani, M. D. (Florence); Privat Docent (Naples), and Albert J. Chalmers, M. D. (Vic. & Liv.), F. R. C. S. (Eng.), D. P. H. (Cam.). Second Edition. New York: William Wood & Company. 1913.

The new edition of this monumental work marks an era in the history of tropical medicine. The volume has well been called "a compendium to date of the world's knowledge of tropical medicine and the sciences with which it is directly allied," and in this improved form is *par excellence* the great encyclopedic reference hand book of this branch of medicine. The mass of information contained in the 1747 pages of the book is vast and the changes from the first edition are many. The authors state that they "have revised most of the chapters, and have added to the letterpress and somewhat extensively to the illustrations." An examination of the volume shows the changes to be well considered, and the additions, both of text and illustrations, to be pertinent and valuable. The general plan of the work, however, remains unchanged, and for reading and reference is most satisfactory. The preparation of such a detailed and complete work in any branch of medicine would be a brilliant achievement, and this is all the more noteworthy in the present instance because of the comparative newness of tropical medicine as a definitely recognized branch of medical science. No matter what other books he may possess, the library of the tropical worker is woefully incomplete without Castellani and Chalmers.

Creighton Wellman.

Malaria: Etiology, Pathology, Diagnosis, Prophylaxis, and Treatment. By Graham E. Henson, M. D., with an introduction by Charles C. Bass, M. D. Twenty-seven illustrations. St. Louis: C. V. Mosby Company, 1913.

This is a convenient and attractive volume of 190 pages. The work is distinctly practical in its aim and it would be well if such a book were in the hands of every general practitioner throughout the South. The small size of the volume precludes any attempt at exhaustive treatment of so great a subject, but the present reviewer could wish to see included several very important recent additions to our knowledge of the subject. For instance, the remarkable work of MacGilchrist and

Digitized by Google

others in India on the solubility and absorbability of quinin salts and the administration of quinin by needle in high dilution with normal salt solution should find mention in the section devoted to the treatment of the disease. A few misprints, one in the dedication, mar the volume.

C. W.

Applied Bacteriology for Nurses. By Charles F. Bolduan, M. D., and Marie Grund, M. D. Illustrated. Philadelphia and London: Saunders Company. 1913.

This pleasant little volume is one of the most successful attempts known to the reviewer to put in simple and concise form the general outlines of medical bacteriology. The information is accurate, clearly conveyed and the illustrations are well chosen and as a rule excellent. The type and general appearance of the book are attractive and it is heartily recommended to the class of readers for whom it is intended.

C. W.

Protective Inoculation Against Cholera. By W. M. Haffkine, Bacteriologist with the Government of India. Calcutta: Thacker, Spink & Co. 1913.

This detailed and illustrated report deals with the preparation of anti-cholera vaccin, with the immunization of persons against cholera and with the devitalization of the anti-cholera vaccin. The historical and polemical aspects of the subjects are discussed. The book is beautifully printed, but has no index. C. W.

REPORTS.

Report of the Department of Sanitation of the Isthmian Canal Commission, July, 1913.

Interesting charts are given showing the incidence of malaria among employees from 1906 to 1913. C. W.

Estudio acerca de los Mosquitos en San Juan, P. R., por W. V. Tower, Estacion Experimental Agricola de Puerto-Rico, Circ. No. 14, 1913.

W. V. Tower reviews his work on the breeding places of mosquitoes in the city of San Juan, P. R., and reports their presence in open cisterns, iron tanks, barrels, roofs, cocoanut shells, watering-troughs and all standing water about the streets and less densely populated sections. Among the species mostly encountered, *Aedes calopus* (*Stegomyia*) was found to predominate, also some common species including *Culex quinquefasciatus*. These were found to be most plentiful during the rainy season, when the supply of water was constantly being replenished. The genus *Anopheles* was not found. As a prophylactic measure,

Digitized by Google

he recommends the emptying of all open receptacles two to three times weekly, especially during the rainy season, and when this is impossible, then substitute by keeping a thin layer of petroleum on the surface of the water, or screenign with wire gauze. In open ponds he recommends the placing of top minnows (*Poecilia vivipara*), as mosquito larvae form a component part of their food. The author also acknowledges the aid of the police of San Juan in collecting specimens.

P. L. Querens.

EXCHANGES.

Anales de la Academia de Ciencias de la Habana.
Annals of Tropical Medicine and Parisitology, Liverpool.
Australasian Medical Gazette.
Bulletin of the Pan-American Union, Washington, D. C.
Indian Journal of Medical Research.
Interstate Medical Journal, St. Louis.
Journal of the American Medical Association.
La Escuela de Medicina, Guatemala.
Medical Record, New York.
Memphis Medical Monthly.
New Orleans Medical and Surgical Journal.
New York Medical Journal.
Revista del Circulo Medico Argentino.
South Carolina Medical Journal.
Southern Medical Journal.
Texas Medical Journal.
Tropical Diseases Bulletin, London.
Virginia Medical Semi-monthly.

REPRINTS.

Balfour, Andrew. Contribution to the Life History of Spirochaetes. Reprinted from Centralbl. f. Bakt., etc. I. Abt. Originale. Bd. 70, Heft 3—4.

Balfour, Andrew. A Year's Anti-malarial Work at Khartoum. Reprinted from The Journal of Tropical Medicine and Hygiene, August 1, 1913.

Goodhue, E. S. Cure of Leprosy an Established Fact. Reprinted from American Medicine, New Series, vol. viii, No. 3, pp. 187-190, March, 1913.

Digitized by Google

Goodhue, E. S. Leprosy and the Knife. Reprinted from The Medical Record, July 19, 1913.

Greig, E. D. W. Enteric Fever in India. All-India Sanitary Conference, Madras, November, 1912.

Sawyer, W. A., and Herms, W. B. Attempts to Transmit Poliomyelitis by Means of the Stable Fly (*Stomoxys calcitrans*). Reprinted from The Journal of the American Medical Association, August 16, lxi, pp. 461-466.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CREIGHTON WELLMAN, M. D. ..... EDITOR-IN-CHIEF
CHARLES CHASSAIGNAC, M. D. }
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine }
JOHN M. SWAN. M. D., Secretary, American Society of Tropical Medicine } *Ex officio.*
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M, D., University of Pennsylvania.
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. NOVEMBER, 1913 NO. 5.

EDITORIAL

The Cost of Preventable Disease.—In the words of one of great authority in the realm of statistics, "every fifty seconds a life is lost from preventable disease." This means that, if present conditions continue to obtain, over six million lives will be needlessly destroyed in the United States during the next ten years. Prof. Irving Fisher, of Yale University, has estimated, on the most conservative basis, that the knowledge which we already possess, if properly applied, "can add fifteen years to the present average length of human life." Contemplating this from purely a mercenary standpoint, that is, saying nothing of the suffering and sorrow involved, and regarding each life lost as worth only the amount earned by the average day laborer, in other words, appraising "each life lost at only $1,700, and each man's average earnings for the year at only $700, the economic gain to be obtained from preventing postponable diseases, measured in dollars, exceeds one and one-half

Digitized by Google

billions annually." It has been conservatively estimated that typhoid fever costs the United States $350,000,000 annually. Malaria costs us $100,000,000 each year from deaths, loss of labor, reduced values in real estate and in other ways. It has been calculated that the yellow fever epidemic of 1878 alone invaded 132 towns, caused a mortality of 15,954 persons, and that the pecuniary loss to the country was not less than $100,000,000 in gold. It is yet too early to secure accurate figures regarding the ravages of hookworm, but it has been estimated that "it costs South Carolina (alone) not less than $30,000,000 per year." Fisher, after studying these appalling figures, concludes that "one-half a billion yearly could be saved from the present cost of illness." And it is cheering to reflect on some of the advances already made. Cholera was wont to visit the cities of the Atlantic Coast in the past about every ten years, and it was a standing menace to the world every summer. It was not uncommon for the disease to decimate whole towns and cities. To-day the disease is unknown in our country. It has been said that the discovery that the mosquito is the carrying agent for yellow fever "is saving more lives annually than were lost in the Cuban war, and that it is saving the commercial interests of the world a greater financial loss each year than the cost of the entire Cuban war." The death rate is twice as high in India as in Europe. During the writer's lifetime the death rate has fallen in Berlin from 33 to 16 per 1,000, and in Washington from 28 to 19 per 1,000, and these differences are largely the triumphs of preventive medicine. Little wonder that the universities, the states and the nation are waking to the enormous and needless waste of vitality and wealth still going on all about us, and that far-sighted men are planning and giving for the purpose of preventing avoidable suffering and death. Little wonder that a distinguished physician has said "the highest aim of

Digitized by Google

scientific medicine to-day is the eradication of preventable diseases," and a great scientist has written that "preventive medicine is the watchword of the hour." Metchnikoff, than whom no greater exponent of these ideas is living, has said "to hygiene belongs without doubt the place of honor in modern medicine. It is in the prevention of infectious diseases that the interest of the medical art is now mainly centered." Thus we see that the trend of scientific opinion and endeavor has set strongly toward the realization of Pasteur's noble dream that "it is within the power of man to rid himself of every parasitic disease," and one of the most cogent factors in the movement is, as it should be, a financial one, for as Emerson said, "Health is the first wealth." Herbert Spencer has said, "To be a good animal is the first requisite to success in life, and to be a nation of good animals is the first condition to national prosperity." But how can we even be good animals while so many educated and refined people are in ignorance of the most elementary principles of hygiene? While one baby out of every five dies before its first birthday is reached, while somebody's ignorance or neglect is responsible for seventy per cent. of all blindness with which humanity is afflicted, how can we call ourselves an educated people? While public sentiment is still at sea, while our legislators, forgetting Beaconsfield's axiom that "the public health is the foundation on which reposes the happiness of the people and the power of a country," and ignoring his high challenge that "the care of the public health is the first duty of a statesman," allow themselves to be duped or bribed into the support of movements against the public weal that would disgrace the dark ages, how can we hold up our heads in a scientific and cultured age? The remedy is to spend more money in health education. "Sanitary instruction is even more important than sanitary legislation." To teach our children how to live healthily and

Digitized by Google

uprightly, to check disease, to eliminate its causes, to strive by educational methods to win a public's coöperation that our ends may be accomplished for the common good, "to uplift and make happy a people and wholesome and beautiful a city"—what work could carry a greater appeal to man, woman, university or nation? *Creighton Wellman.*

Appreciation.—This JOURNAL has received from individuals, institutions and scientific journals a large number of kind and encouraging greetings. Some of the most influential journals have declared their editorial good will, and among the letters sent us are those from the most distinguished names to-day in tropical medicine and in hygiene. The JOURNAL will endeavor to merit in as much as lies in our power the praise and confidence of those whose good will we value and appreciate. Any publication, and particularly a special journal of this kind, is dependent upon its friends and readers for any measure of success and usefulness it may hope to attain, and we invite the criticism, the suggestions, the contributions and the support of the members of the American Society of Tropical Medicine, which the JOURNAL officially represents, and of all others who are interested and engaged in the practice, investigation or teaching of tropical mediicne and preventive medicine throughout the world. With such coöperation and encouragement, we shall endeavor to make the JOURNAL all its friends and well-wishers desire.

C. W.

Insects and Disease.—Medical entomology, or rather medical arthropodology, is not a new science, but a realization of its far-reaching importance is one of the hopeful signs of the present day. The history of this body of knowledge has been sketched by the writer[1] and may be repeated here in part. It

1. California State Journal of Medicine, 1910.

Digitized by Google

is probable that insects were employed medicinally in Egypt during the most ancient times,[2] and several species, especially beetles belonging to the family Dermestidæ, have been found embalmed in mummies, while the traditional virtues ascribed to scarabs are yet believed in by the fellaheen. Aristotle[3] mentions various insects, including beetles probably belonging to the genera *Melolontha, Carabus, Lytta,* etc., in use in his day, and in Pliny[4] we find remarks on a long list of species used medicinally or considered noxious, among which have been determined beetles (*Lucanus cervus,* Scarabæidæ, e. g. "green scarabæus" for quartan ague, *Buprestis, Blaps mortisaga,* etc.), crickets (*Gryllus*), bugs (*Cimex*), mosquitoes, honey bees, spiders, scorpions, etc. Galen[5] also mentions various beetles (*Dermestes typographus, Scarabaeus*), bugs (*Coccus*), spiders and scorpions. Discorides[6] speaks of a common Lepidopteron (*Papilio brassicae*) and also of grasshoppers, blister beetles (*Mylabris*), spiders, etc. Later the Arabian physicians, notably El Scherif and El Mansuri,[7] frequently mention such insects as lice and bugs and developed the use of kermes (*Coccus ilicis*) for various ailments. Still later as printing arose, while many such as Schäfer of Regensburg[8] still wrote much of entomological materia medica, attention began to be fixed more and more on clinical entomology as it may be termed. Such authors as Wietzel,[9] Heize[10] and Stentzel and Vaghi[11] are typical of this movement. A great landmark not only in the history of medical ento-

2. Ebers, Trans. 10th Internat. Med. Cong., V, Pt. 16, 1890.
3. Περὶ τα ζῶα ἱστορίαι, B. 25, 531 ff. (Cf. also B. 1, 552 ff.) Berl. Ed.
4. Historia Naturalis, Lib. 11, 41; 29, 32; 30, 10 ff., etc.
5. De Simplic. Medicam., Lib. 4, etc.
6. De Mat. Med., Lib. II, C. 54, etc.
7. Kunze, Entomological Materia Medica, or an Enumeration of Insects Employed by Physicians, etc., 1893.
8. Abbildung und Beschreibung des Mayenwurmkäfers, etc., 1778. See also Ephem. Med. Phys. Obs., CCCII, De Mors. Can. Rabid., 1681, etc.
9. De Morsibus et Puncturis Animalium, 4to, 1676.
10. De Insectorum Noxio Effectu in Corp. Human., 1757.
11. De Insectorum in Corpore Humano, etc., 4to, 1794.

Digitized by Google

mology, but also of medical zoology, was the work of Brandt and Ratzeburg.[12] In these still remarkable volumes not less than 142 quarto pages and 14 beautiful plates are devoted to an admirable discussion of the medical aspects of entomology. A number of general works on medical zoology[13] contain more or less complete notices of insects. A list of these would not be of particular interest and all are, or should be, easily accessible. The most complete résumé of our knowledge of insects as disease carriers is the monograph of Nuttall[14] which digests the literature up to the date of its publication. A glance through the literature of the subject shows that we have three main movements among the students of medical entomology. These may be loosely described as the era of entomological materia medica, the era of clinical entomology, and the era of pathological entomology. Of the first of these it will not be necessary to say anything further, as, with the exception of cantharides and one or two other remedies, we retain but few of these formerly used substances in our lists, and our interest in the subject thus becomes largely historical. Of the second subject it will be useful to speak a few words, because the conditions included are always of interest to the physician. Mention might be made of the great mass of literature on the subject of scabies,[15] reaching from Aristotle to our own time. The subject of myiasis,[16] too, early attracted attention, especially since about 1840. Records of fly larvæ in the nose,[17] ear,[18] urethra,[19] intestinal canal,[20]

12. Medizinische Zoologie, Berlin, 1833.

13. Huber, Bibliographie der Klinischen Entomologie, Jena, 1899. (Good List of Gen'l Titles.)

14. Johns Hopkins Hosp. Reports, V, 1899.

15. Wichmann, Atiologie der Krätze, Hannover, 1786 (for earlier works) for Recent Literature, see Huber, Op. cit.

16. Hope, Trans. Ent. Soc., Lond., Vol. II, 1840.

17. Joseph, Deutsch. Med. Zeits., No. 4, p. 37 ff., 1885.

18. Baxter, Zeits. f. Ohrenheilk., p. 120 ff. (See also Richardson, Ibid., p. 292, 1896, Braislin, Ibid., p. 370, 1897, etc.)

19. Lallier, Thèse de Paris, 1897.

20. Wellman, Am. Jour. Med. Sci., May, p. 6 ff., 1906, Jour. Trop. Med. Hyg., June, 6. 186 ff., 1907.

Digitized by Google

wounds,[21] skin,[22] etc., are also interesting. Among other insects the South American and African chigger[23] likewise invades the human body, and probably the most formidable of all such parasites are the Arachnid Linguatulidæ.[24] Considerable attention has also been directed to venomous insects. For instance, we read of severe symptoms,[25] new growths[26] and even death[27] following on the bites or stings of these creatures. But the most interesting and important is what we have called pathological entomology, in other words the investigation of insects as disseminators of parasitic disease. Among such there are the midges,[28] which are believed to carry a serious febrile disease. Mosquitoes have been shown to be responsible for yellow fever,[29] dengue,[30] filariasis[31] and malaria.[32] No less than 33 species are known to carry this last disease.[33] House flies[34] and their allies have been convicted of disseminating enteric fever,[35] tuberculosis[36] and the ova of intestinal worms,[37] and probably opthalmia[38] and other diseases. Fleas are known to transmit bubonic plague,[39] and sleeping sickness[40] is spread

21. Huber, Op. cit., pp. 5-6.
22. Huber, Op. cit., p. 13 ff.
23. Wellman, Am. Jour. Med. Sci., loc. cit., Jour. Trop. Med., June, p. 186 ff.
24. Koch, M., Verh. Deutsch. Path. Gesell, pp. 265 ff., 1906.
25. Parry, Lancet, p. 1120 ff., 1901.
26. Hodenpyl, Proc. N. Y. Path. Soc., p. 41, 1901; also Woolley, Lancet, p. 400 ff., 1901.
27. Cooke, Brit. Med. Jour., p. 1429, 1898; also Moore, Ibid., p. 1437 ff., 1900.
28. Austen, Trans. Soc. Trop. Med. Hyg., Vol. II, p. 197 ff., 1902; African Blood- Sucking Flies, 1909.
29. Reed, Vaughn and Shakespere, Gov't. Rep., Washington, 1904.
30. Graham, Jour. Trop. Med., 1903, p. 209 ff.
31. Manson, The Filaria Sanguinis Hominis, 1883.
32. Manson, Trop. Dis., 1907.
33. Anders, New Orleans Med. and Surg. Jour., Vol. 61, 1909.
34. Skinner, Trans. Am. Soc. Trop. Med., 1909.
35. Lord, Pub. Mass. Gen. Hosp., No. 59, 1906.
36. Grassi, Gaz. Degli Ospitali. No. 59, 1885.
37. Wherry, Cal. State Jour. Med., p. 13 ff., 1907.
38. Jour. Hyg., Vol. 6, No. 4, Vol. 7, Nos. 3-6.
39. Austen, Monograph of the Tsetse-flies. 1903.
40. Patton, Trans. Soc. Trop. Med. Hyg., Vol. II, No. 3, 1909.

Digitized by Google

by means of the Tse-tse flies. Kala-azar[41] is almost certainly carried by bed bugs. Relapsing fever is disseminated by bed bugs[42] and ticks,[43] and spotted fever[44] by these last-named animals. Other insects have been laid under suspicion as disease carriers and the foregoing are only illustrative. The literature of medical entomology is enormous and a catalogue of the principal titles alone would occupy more space than the colmuns of this entire issue of the JOURNAL, and the opportunities for research in this field are very great. The recent work on the arthropodal transmission of such diseases as pellagra, typhus, and seven-day fever in India reveal the possibilities and the necessity for more research of this kind, research that is peculiarly the province of the student of tropical diseases and preventive medicine. *C. W.*

41. Nuttall, loc. cit.
42. Dutton and Todd, Mem. Liverpool Sch. Trop. Med., No. XVII. Wellman, Jour. Hyg., Vol. 6, No. 3, p. 237 ff.
43. Ricketts, Jour. Infect. Dis., 1907, p. 141 f.
44. Ward, Western Med. Rev., p. 117 ff., 1908.

Digitized by Google

ORIGINAL ARTICLES

THE CLASSIFICATION OF AMOEBAE, WITH SPECIAL REFERENCE TO THE PARASITIC SPECIES.*

CHARLES F. CRAIG, M. D.,
Captain, Medical Corps, U. S. Army.
(From the Department Laboratory, Central Department, U. S. Army, Fort Leavenworth, Kan.)

Recent observations upon amoebae, especially upon those parasitic in man and animals, have rendered a reclassification of these organisms imperative, both for convenience of description, and if one desires a clear conception of the exact biological position of many of the species frequently mentioned in the literature of medicine.

Within the past three or four years several classifications have been proposed, notably by Doflein, Hartmann, Alexeieff, Chatton, Calkins and others. The most recent and, it appears to me, the most logical, is that of Calkins, and it is the one that is largely followed in this brief contribution to the subject. However, it should be remembered that the classification of many of the species of amoebae that have been described must remain purely tentative until further observations are made upon their morphology and life-cycle, and while I will list these species under their respective generic headings, it must be understood that this does not indicate that I accept their specific identity. Until the entire life-cycle of any organism is thoroughly worked out it is impossible accurately to classify it, and this has not been accomplished for many of the so-called species of amoebae.

Calkins divides the old genus *Amoeba* into seven genera, as follows: *Amoeba, Vahlkampfia, Nagleria, Paramoeba, Craigia, Trimastigamoeba,* and *Entamoeba.* The characteristics of the genera and the organisms included in each follow:

*Received for publication November 6, 1913. Published with authority of the Surgeon General, U. S. Army.

Digitized by Google

Genus *Amoeba*, Bory 1822. This genus was established by Bory to include the minute organism first described by von Rosenhoff, and which is now known as *Amoeba proteus*, the type species of the genus.

The genus *Amoeba* is characterized by large amoeboid organisms, having one or more nuclei and contractile vacuoles, the nucleus containing a large karyosome or scattered granules of chromatin. The ectoplasm and endoplasm usually distinct. Reproduction by division or sporulation. The following amoebae are included in this genus by Calkins:

Amoeba poteus Pallas, 1766. Habitat, ponds and ditches.

A. vespertilio Penard, 1902. Habitat, ponds and ditches.

A. flava Greef, 1891. Habitat, salt water.

A. verrucosa Ehrenberg, 1838. Habitat, fresh water.

A. terricola Greef, 1891. Habitat, moss.

All the amoebae included in this genus are free-living and of little interest to physicians, as their large size distinguishes them from any amoebae found in man or other animals, and because they have never been found to contaminate cultures from the faeces or other material in which the parasitic amoebae may be present. The species vary much in size, some measuring as much as 1 mm. in length, while others may measure as little as 100 microns.

Genus *Vahlkampfia* Chatton, 1912. This genus, established by Chatton, contains certain small amoebae originally classed in the genus *Amoeba* under the so-called *limax* type. Calkins does not include species having a flagellate stage of existence in this genus, and I am fully in accord with him in considering these species as belonging to different genera.

This genus contains amoebae characterized by the presence of one or more nuclei, dividing by simple division or a very primitive form of mitosis, and encysting to form a uninucleate cyst. A contractile vacuole is almost invariably present, and sometimes more than one. The nucleus contains a very large karyosome which sometimes shows a distinct centriole. Habitat, water and earth. Have been observed as parasites.

The following species are included in this genus:

Vahlkampfia limax Dujardin, 1841. Habitat, fresh water.

Digitized by Google

V. guttula Dujardin, 1841. Habitat, pond water.

V. polypodia Schultze, 1875. Habitat, pond water.

V. binucleata Gruber, 1884. Habitat, pond water.

V. diploidea Hartmann and Nagler, 1908. Habitat, garden earth.

V. albida Nagler, 1909. Habitat, garden earth.

V. horticola Nagler, 1909. Habitat, garden earth.

V. lacustris Nagler, 1909. Habitat, fresh water.

V. froschi Hartmann, 1907. Habitat, fresh water.

V. lacertae Hartmann, 1907. Habitat, in gut of lizards.

V. mucicola Chatton, 1909. Habitat, ectoparasitic on fish.

V. paedophthora Caullery, 1910. Habitat, eggs and embryos, crabs.

V. tachypodia Glaser, 1912. Habitat, pond water.

V. lamellipodia Glaser, 1912. Habitat, pond water.

V. lobospinosa Craig, 1912. Habitat, ditch water.

V. whitmorei Hartmann, 1913. Habitat, swamp water.

While most of the species mentioned are free living, there is excellent evidence on record that some of them may become parasitic. The species found in the intestine of the lizard by Hartmann, and named *Vahlkampfia lacertae,* is certainly a parasitic species, and several observers have noted typical amoebae of this genus in the faeces of man, both in the vegetative and cystic stages of development. Quite recently, Dr. W. M. James, of Panama, has sent me beautiful preparations showing a typical *Valkampfia,* in the vegetative and cystic stages of development, the preparations having been obtained from the faeces of a patient who showed these organisms over a considerable period of time, so that there can be little or no question that they had established themselves in the intestinal tract. There was no difficulty in distinguishing them from *Entamoeba histolytica* or *Entamoeba coli.*

Many, if not all, of the organisms included in this genus can be cultivated upon artificial media, and it is this fact that has given rise to so much confusion regarding the cultivation of the parasitic amoebae, as these organisms frequently contaminate faecal or other material derived from patients suffering from amoebic dysentery. Organisms belonging to this genus

Digitized by Google

have been cultivated by many observers, notably Musgrave and Williams, the latter securing them in pure culture, but the claims made by these investigators that the amoebae so cultivated are true dysentery amoebae are unsupported by adequate evidence, and it is now generally admitted by all competent observers that neither *Entamoeba histolytica*, the chief cause of dysentery in man, or *Entamoeba coli*, the harmless entamoeba of man, has been cultivated.

While, as has been stated, species belonging to this genus have been observed apparently parasitic in the human intestine, and while, in some cases, they may be easily cultivated from the faeces, the pus of liver abscesses, and other sources, there is no evidence demonstrating that they are pathogenic, and in the vast majority of instances they reach the culture media from the air or, if cultivated from the faeces, by passing through the intestinal canal in the encysted stage. They may be easily distinguished from the true parasitic amoebae by the large nuclear karyosome, the uninucleate cyst, and the presence of at least one contractile vacuole.

It is evident that while in very rare instances certain species of *Vahlkampfia* may become pseudo-parasitic, this is really an abnormal mode of existence, but it is of great interest from an evolutionary standpoint as indicating the possible origin of the true parasitic amoebae.

Genus *Nagleria* Alexeieff, 1912, emend. Calkins, 1913. This genus was established by Alexeieff to include all the species now placed in the genus *Vahlkampfia*, but Calkins considers that in this genus should be included only those forms having a flagellated stage of deevlopment either upon culture media or during their normal life cycle. The amoebae included in this genus are similar in their general morphology to those included in the genus *Valkampfia*, but differ in that the adult forms acquire two flagella under certain conditions. In this genus Calkins names one species, *Nagleria punctata* Dangeard, characterized by a nucleus containing a distinct karyosome, and two flagella situated at the anterior end of the body and equal in length to the body cell. Encystment occurs, the cyst being uninucleate. The species lives in pond water.

Digitized by Google

The genus *Nagleria*, as emended by Calkins, is of little interest to physicians, as it contains no organism occurring in man.

Genus *Paramoeba* Schaudinn, 1896. Schaudinn established this genus to include a species that he found in a marine aquarium, characterized by an accessory body to the nucleus and a flagellated stage of existence. The accessory body divided into a certain number of parts, followed by the division of the nucleus into as many parts, and at a certain stage of the life-cycle flagellated swarm spores were formed, each containing two chromatophores and possessing two flagella. The name *Paramoeba eilhardi* was given this amoeba by Schaudinn and it is the only species contained in the genus. The peculiar relation of the accessory body, or "Nebenkorper," as Schaudinn called it, to the nucleus, serves to distinguish this genus from *Nagleria*.

Genus *Craigia* Calkins, 1912. The genus *Craigia* was established by Calkins, in 1912, to include the amoeba described by myself, in 1906, under the name *Paramoeba hominis*. I placed this parasite in the genus *Paramoeba* because of its general resemblance in morphology and life-cycle to Schaudinn's *Paramoeba eilhardi*, but Calkins rightly calls attention to the fact that in the flagellated stage of existence this organism possesses only *one* flagellum, instead of two, as is the case in *Paramoeba eilhardi*, and that it is doubtful if the accessory body present is identical with that of the latter species. On these grounds he considers that the parasite should be placed in a new genus, an opinion previously expressed by Doflein, and with which I am in agreement.

The type species of this genus is *Craigia hominis* (*Paramoeba hominis*), a parasitic amoeba that I have observed in ten patients suffering from a chronic form of diarrhoea. It is characterized by a nucleus, an accessory nuclear body, and by an amoeboid and flagellate stage of development. In the amoeboid stage multiplication occurs by simple division and by the formation of cysts containing numerous flagellated organisms. In the flagellate stage of development multiplication occurs by longitudinal division, preceded by division of the accessory body and nucleus. This parasite has been found only in the human

Digitized by Google

intestine and it is believed to give rise to a severe form of chronic diarrhoea.

In this genus there are also included two other species that are found as parasites in certain species of marine worms. They are:

Craigia pigmentifera Grassi, 1881. Habitat, body cavity of *Chaetognatha.*

C. chaetognathi Grassi, 1881. Habitat, body cavity of *Chaetognatha.*

The genus *Craigia* is of considerable interest to the physician as it contains a species that may be easily confused, during the amoeboid stage, with amoebae belonging to the genus *Entamoeba,* because there is good reason to believe that it is a pathogenic parasite. It has been observed only in patients suffering from a severe form of chronic diarrhoea, which ceased as soon as the organisms disappeared from the faeces, and while I have been unable to produce any symptoms or lesions of disease in kittens by feeding or injecting them with material containing the parasite, I am of the opinion that it is the cause of a form of chronic diarrhoea.

In a recent publication Hartmann concludes that I described this species from certain stages of *Entamoeba coli* and *Trichomonas,* but in my original description I called attention particularly to the differentiation of this parasite from *Entamoeba coli, Entamoeba histolytica* and *Trichomonas hominis,* and therefore there is no warrant for this conclusion of Hartmann, who has evidently not read my publications carefully or has chosen to ignore my statements in this respect. In view of the statement of Hartmann I will here insert the description of the differential diagnosis of *Craigia hominis,* occurring in my work, "The Parasitic Amoebae of Man," page 228, which is practically copied from my original description of the species:

— "*Differential Diagnosis.* In the amoebic stage of development *Paramoeba hominis* (*Craigia hominis*) might be confused with *Entamoeba coli, Entamoeba histolytica,* or *Entamoeba tetragena.* (This was before I was convinced that *E. histolytica* and *E. tetragena* were identical.) If it be remembered that the endoplasm of this species is more refractive than is the ectoplasm, it will be easy to distinguish it from other intestinal amoebae. However, the occurrence of the peculiar cysts and of the

Digitized by Google

flagellate stage of development, at the same time, should enable one to diagnose this species of amoeba with but little difficulty. When one observes in faeces the peculiar rotating organisms which I have described, one may be sure that *Paramoeba hominis* is present.''

''In the flagellate stage of development the only organism occurring in the faeces which might be mistaken for *Paramoeba hominis* is *Trichomonas hominis*, because of certain peculiarities in the development of the altter. *Trichomonas hominis* is frequently observed in the resting stage, when it is spherical in shape, and appears to possess a limited amoeboid motion. However, it is much smaller than *Paramoeba hominis* and never shows the active progressive motion observed in the latter. The flagellate stage of *Paramoeba hominis* is distinguished from active trichomonads by the absence of an undulating membrane, the presence of but one flagellum, and the spherical form of the organism.''

''The simultaneous occurrence in the faeces of the amoebic stage, the encysted stage, and the flagellate stage of *Paramoeba hominis*, is characteristic of this organism, and no difficulty should be experienced by one who is well acquainted with intestinal protozoa, in differentiating this species from other parasites which infest the intestine of man.''

I think that it must be evident to every fair-minded observer that the above description completely negatives Hartmann's statement that sufficient care was not taken to differentiate *Craigia hominis* from other intestinal parasites, and proves the injustice of such a statement. It would be absolutely impossible for anyone at all acquainted with the organisms in question to confuse them, and while I am convinced that this has occurred, in many instances, it has been because of the ignorance of the observer, and not because the original description of the parasite was at fault.

Genus *Trimastigamoeba* Whitmore, 1911. This genus was established by Major E. R. Whitmore, Medical Corps, U. S. Army, to include an amoeba cultivated from tap water in Manila, P. I. This organism, named by Whitmore *Trimastigamoeba philippinensis*, is the type species of the genus, and is characterized by a nucleus of the *limax* type, a contractile vacuole, and the occurrence, under certain conditions, of flagellate forms having three equal flagella. The species can be easily cultivated upon suitable media. No other species are included in the genus.

Trimastigamoeba philippinensis is of interest to physicians, as it may contaminate cultures from the faeces, or other mate-

Digitized by Google

rial from dysenteric patients, and thus be mistaken for one of the true parasitic amoebae or a trichomonad. There is no evidence, at present, that the one species in this genus is parasitic.

Genus *Entamoeba* Leidy, 1879. The genus *Entamoeba,* containing most of the parasitic amoebae of man and other animals, was established in 1879 by Joseph Leidy, who used the spelling *Endamoeba* in the description of the genus. The type species is *Entamoeba blattae,* of the cockroach. In 1897, Casagrandi and Barbagallo, ignorant of Leidy's genus *Endamoeba,* established for the parasitic amoebae the genus *Entamoeba,* but to Leidy actually belongs the credit of first pointing out the essential differences between the free living and parasitic amoebae, so that the genus was actually created by him.

The generic characters are as follows: Size comparatively small, from 5 to 80 microns; ectoplasm and endoplasm distinct when the parasites are moving and often when motionless; a contractile vacuole generally absent; nucleus with a definite karyosome and centriole; nuclear division mesomitotic and mitotic; reproduction by simple division, schizogony, or cyst formation with the production of several daughter amoebae in the cyst. Habitat, the body of man or other animals, generally in the digestive tract. The genus contains only parasitic species, some of which are pathogenic, but most living merely as commensals in the intestines of their host. None of the species have been artificially cultivated.

A very large number of species of amoebae have been placed in this genus and I have included in the list that follows all that I have been able to collect in the literature. Several of the species listed have already been found to be identical with other species named, and where this is true I have so indicated. The name of the parasite is followed by the name of the host, so far as determined, and the list is arranged alphabetically.

Entamoeba africana Hartmann, 1907. Identical with *E. histolytica.* Host, man.

Entamoeba blattae Leidy, 1879. Host, cockroach.

Entamoeba aulastomi Noller, 1912. Host, eagle.

Entamoeba bovis Liebetanz, 1905. Host, cattle.

Entamoeba brasiliensie Beaurepaire aragao, 1912. Host, man.

Digitized by Google

Entamoeba buccalis v. Prowazek, 1907. Host, man.

Entamoeba buetschlii v. Prowazek, 1912. Host, man.

Entamoeba cobayae Walker, 1908. Host, guinea pig.

Entamoeba coli Loesch, emend. Schaudinn, 1903. Host, man.

Entamoeba dentalis Braun, 1883. Identical with *E. buccalis.* Host, man.

Entamoeba dysenteriae Councilman and Lafleur, emend. Craig, 1905. Identical with *E. histolytica.* Host, man.

Entamoeba gingivalis Braun, 1895. Identical with *E. buccalis.* Host, man.

Entamoeba hartmanni v. Prowazek, 1912. Host, man.

Entamoeba histolytica Schaudinn, 1903. Host, man.

Entamoeba intestinalis Walker, 1908. Host, cat.

Entamoeba kartulisi Doflein, 1901. Host, man.

Entamoeba lacertae Hartmann, 1907. Identical with *Vahlkampfia lacertae.* Host, lizard.

Entamoeba lagopidis Fantham, 1910. Host, moor hen.

Entamoeba maxillaris Kartulis, 1906. Identical with *E. kartulisi.* Host, man.

Entamoeba minuta Elmassian, 1909. Identical with *E. histolytica.* Host, man.

Entamoeba miurai Ijima, 1898. (Probably not an amoeba.) Host, man.

Entamoeba mortinatalium Smith and Weidman, 1910. Host, man.

Entamoeba muris Grassi, 1881. Host, mouse.

Entamoeba nipponica Koidzumi, 1909. Identical with *E. coli.* Host, man.

Entamoeba nuttalli Castellani, 1908. Host, monkey.

Entamoeba phagocytoides Gauducheau, 1907. Host, man.

Entamoeba pitheci v. Prowazek, 1912. Host, monkey.

Entamoeba polecki v. Prowazek, 1912. Host, swine and man.

Entamoeba pulmonalis Artault, 1898. Host, man.

Entamoeba ranarum Grassi, 1879. Host, frog.

Entamoeba salpae Alexeieff, 1912. Host, fish.

Entamoeba schaudinni Lesage, 1908. Host, man.

Entamoeba suis Hartmann, 1913. Host, swine.

Entamoeba testudinis Hartmann, 1910. Host, turtle.

Digitized by Google

Entamoeba tetragena Viereck, 1907. Identical with *E. histolytica.* Host, man.

Entamoeba tropicalis Lesage, 1908. Identical with *E. coli.* Host, man.

Entamoeba undulans Castellani, 1904. Host, man.

Entamoeba urogenitalis Baelz, 1883. Host, man.

Entamoeba williamsi v. Prowazek, 1911. Probably identical with *E. coli.* Host, man.

While I am of the opinion that many of the species of entamoebae given in this list, and especially some of those described as occurring in man, are not entitled to specific rank, I cannot deny their existence as species, as I have had no opportunity of studying preparations containing them, and I desire to protest strongly against the unjust practice of some protozoologists who deny the existence of species described by other observers without having studied preparations, or even requesting that such preparations be sent them for study. This method of deciding the specific value of an organism has absolutely no weight as evidence either for or against the validity of the species in question, and is unworthy of any scientific investigator.

Among all of the species of entamoebae listed there are but two that are of really great interest to the physician, i. e., *Entamoeba histolytica* and *Entamoeba coli.* The former is a common pathogenic species causing a form of dysentery and liver abscess in man, while the latter is a harmless commensal, found in a varying, but usually large percentage of healthy, as well as diseased individuals, in almost every part of the world.

The most recent researches have shown that *Entamoeba tetragena* and *Entamoeba minuta* are identical with *Entamoeba histolytica,* while *Entamoeba nipponica* is identical with *Entamoeba coli,* and it therefore follows that these three names should be dropped from our nomenclature. As regards the other species described as parasitic in man, *Entamoeba buccalis* is undoubtedly a true species, but this cannot be truthfully stated of any of the other species listed, as the question of their specificity is still *sub judice.*

A certain amount of controversy has recently arisen regarding the proper name for the common pathogenic entamoeba of

Digitized by Google

man, now known as *Entamoeba histolytica.* Since it has been definitely proven that *Entamoeba tetragena* is identical with this species, the name *"tetragena"* must be dropped from the nomenclature and this is admitted by nearly all observers, including Doflein, Hartmann, Fantham, Wenyon, Whitmore and others, but Doflein, followed by Hartmann, considers that in this case the specific name *"dysenteriae,"* proposed by Councilman and Lafleur, should be substituted for *histolytica.* This is not a new proposition, for in 1905 I suggested that the name *dysenteriae* should be given the entamoeba concerned in the production of dysentery, but as Councilman and Lafleur did not differentiate the harmless and pathogenic entamoebae and gave no morphological data sufficient to establish the species independently, I believe that this name cannot be used in preference to the name Schaudinn gave, which was based upon distinct differences between the pathogenic species and the harmless *Entamoeba coli.* I am therefore of the opinion that the name *histolytica* must be retained for the pathogenic species of entamoebae now generally accepted as the cause of entamoebic dysentery, if we are to be consistent in our rules of nomenclature.

The classification of amoebae given in this paper, essentially that of Prof. Calkins, appears to possess great advantages over any that has preceded it, and to be the best suited as a working basis in the present state of our knowledge of these organisms. It will almost surely have to be revised and probably contracted, as our knowledge increases, but this is also true of any other classification that has been proposed. It has therefore been thought that a brief review of the subject might prove of service to students and physicians interested in the parasitic amoebae of man.

References.

Calkins, G. N. Genera and Species of Amoeba. Trans. XV Internat'l Cong. on Hyg. and Demog., Vol. II, p. 287, 1913.

Hartmann, M. Morphologie und Systematik der Amoben. Handbuch. d. Path. Micro-organ. Auflage II, VII, p. 607, 1913.

For a complete Bibliography those interested are referred to Hassall's Bibliography of Parasitic Amoebae. Vol. II, XV Int. Cong. on Hyg. and Demog., p. 198, 1913.

Digitized by Google

ON THE BACTERIAL POLLUTION OF THE MISSISSIPPI RIVER WATER BY THE SEWAGE EFFLUENT FROM THE CITY OF NEW ORLEANS.*

HENRY EUGENE LEMOINE, C. E.
(From the School of Hygiene, Tropical Medicine and Preventive Medicine, Tulane University.)

Contents.

Introduction.
Historical.
The Problem Studied in This Paper.
Samples Examined and Method of Collection.
Technic and Procedure Adopted.
Bacterial Counts.
Determination of Presence and Number of *B. coli.*
Significance of Term *B. coli.*
Some Results from Different Tests for *B. coli.*
Discussion of Data.
Relation Between the Stage of River, Turbidity.
Bacterial Count and *B. coli* per Cubic Centimeter.
Sanitary Conditions in the Immediate Vicinity of the Sewer Outlet.
Comparison of Mississippi River Before and After Pollution.
The Low Count of the Sewer Outlet.
Increased Pollution of Mississippi River Water at the Intake Pipe.
Summary of Results.
Conclusions.
Bibliography.

Introduction.

The method of sewage disposal by dilution has been, and will continue to be, the prevailing one in this country as long as natural and legal conditions permit its prevalence. This method of disposal has presented to the sanitary engineer, and the country at large, a most intricate problem, viz.: the control of water pollution by sewage. An attempt has been made by many eminent men to formulate laws by which this problem may be solved, but up to the present time, and most likely for some time to come, these laws will be applicable only in a general

*Received for publication November 4, 1913.

Digitized by Google

way. It is more feasible to state that the only method of control will be to formulate laws for each particular case. This is only natural, because each river, stream or lake, etc., presents conditions which are not likely to be duplicated by the conditions of any other river, stream or lake, etc. Therefore, if this be accepted, it becomes necessary for a town or corporation to investigate local conditions as far as possible, before discharging their sewage into the river, stream or lake in question.

Some of the most important things to be considered are the volume of water into which the sewage is to be emptied, the chemical properties of the sewage and water, distances down stream of cities using river water as a water supply, and the ability of the river or stream to purify itself. All of these, with the exception of the last one, are easily determined.

Referring to the self-purification of rivers, the opinions of sanitarians differ upon the actual value of self-purification of rivers in purifying sewage. An example of this was clearly brought out in the legal proceedings between the State of Missouri and the City of Chicago. The conditions here were ideal for an investigation of the self-purification of rivers, and the experimental data, both chemic and bacteriologic, showed that there was something more in this theory than merely an "interesting biological myth." There is no doubt that rivers do purify themselves to a certain extent, but it appears from the records of epidemics of typhoid fever traced to the drinking of water drawn from rivers polluted with sewage, that this property of a river must not be relied upon, so far as the public health of a community is concerned. No doubt it has some value, in that it reduces the number of bacteria, thereby diminishing the load on the filtration plant. The question which has not been settled is: does self-purification destroy the dangerous pathogenic germs which produce the so-called water-borne disease?

The question of sewage disposal at New Orleans did not reveal any intricate problems, because the conditions existing here were as nearly ideal as nature permits. A large river with an enormous discharge, an abundant supply of filtered water, which affords a highly diluted sewage effluent, and no obstacle which could bring about any legal controversies. In fact, there is no

Digitized by Google

town of any considerable size situated between New Orleans and the Gulf of Mexico, a distance of about one hundred miles. Therefore, under the above conditions, the Mississippi River at New Orleans does not present a great practical need for an investigation of the self-purification of rivers, but is very interesting to bring out from an investigation, the actual effects, that is so far as our bacteriologic methods allow, that sewage has upon a very large volume of "running" water.

Historical.

In 1900-01 Robert Spurr Weston made an extensive investigation in order to ascertain data as to the advisability of purifying the Mississippi River water so that it could be used as the public water supply of New Orleans. A large amount of analytical work was accomplished in order to determine the character of this water. There were made 8,878 quantitative bacterial analyses, and 100 tests for *B. coli communis*. "In the 100 tests with volumes of water varying from 1 to 300 cubic centimeters, its presence (*B. coli communis*) was demonstrated only three times, although the large samples were concentrated in a centrifuge before being seeded in the media contained in fermentation tubes."

The method used for these tests was: dilutions "of the sample to be tested were sown into dextrose broth, and the cultures showing positive results were plated on lactose-litmus-agar plates. Characteristic red colonies were then selected for seeding the various conventional media." These samples concentrated in a centrifugal machine, were "sown in phenol-dextrose broth contained in fermentation tubes, which were incubated at blood temperature for not less than 48 hours. Cultures which then showed the possible presence of the looked-for bacteria were sown on lactose-litmus-agar plates, as described above." As has been stated, most of the samples tested were negative.

The above investigation is the only one on the Mississippi River water at New Orleans that the writer has been able to find.

Digitized by Google

The Problem Studied in this Paper.

The object of this investigation is primarily to ascertain, as far as possible, the actual bacteriologic effects of the sewage effluent of the City of New Orleans on the water of the Mississippi River; that is, the effect on the total number of bacteria per cubic centimeter, and the number of *B. coli* in one cubic centimeter. The observations extended over a time which allowed the effects of the low and high stages of the river to be observed.

With this object in view, it was decided that the work to be undertaken was the obtaining of data by which the sanitary condition of the river water could be determined before, and after, pollution. Three places were selected, from which water was to be taken, in order to obtain the above conditions. One, far enough above the city so that the water could not receive any polluting material whatever from factories or other commercial industries situated on the bank and dumping waste products into the river. Another, in the immediate vicinity of the sewer outlet, and the other some distance downstream, so that the sewage would have ample time to be mixed with the river water.

The work of collection was started on January 6, 1913, and extended until March 6, 1913. An endeavor was made to collect samples every day, and under the same conditions in every case. Unfortunately, the former was impossible, due to several interruptions, but the latter was carried out to the best of the writer's ability. Twenty-five samples, from each of the selected places, were collected and tested, both for the total number of bacteria per cubic centimeter, and the presence and number of *B. coli.*

Samples Examined and Method of Collection.

Samples were collected and examined daily except Saturdays, Sundays and holidays, between January 6, 1913, and March 6, 1913, from the following sources:

1. Mississippi River water, from the intake of the New Orleans water works at the head of General Ogden street. As a matter of convenience, the sample was collected for the writer by

Digitized by Google

Mr. Charles Jacob, B. E., who was at the time collecting samples for his investigation of the water supply of this city, from the intake pipe at the purification plant. There was no perciptible difference between the water at the intake grating and the end of the intake pipe at the head house of the purification plant.

2. Mississippi River water, from the head of Spain street, about fifty feet downstream from the main sewer outlet.

3. Mississippi River water, from head of Clouet street, about 2,200 feet downstream from the main sewer outlet.

As a preliminary step, to obtain the best location from which samples were to be collected, several samples were taken at different distances from the sewer outlet. At about 400 feet downstream, and off the end of a wharf, the quality of the water was found to be about the same as that of the intake. This was due to the currents of the river taking the sewage out into midstream. Several locations were tried until one was reached sufficiently near the outlet to give comparable results, this distance being about fifty feet downstream. Other observations were made with the vinew of obtaining a location where samples could be collected, after the sewage had been thoroughly mixed with the river water. Preparations were made in order to make float observations to determine the direction of the currents in the immediate vicinity of the sewer outlet. Fortunately, on the day set for these observations, a considerable amount of sawdust was dumped into the river a few hundred feet upstream, enabling the writer to select an appropriate place, without the aid of floats. The place selected was at the foot of Clouet street.

Eight-ounce bottles, with glass stoppers, were used in collecting the samples. These bottles were washed in ordinary tap water, rinsed in distilled water, the cap of stopper and the neck of the bottle were covered with tin foil, and sterilized at least for one hour in the dry-heat sterilizer at 160° C.

An apparatus made by the writer was used in the collection of the samples. It consists of a copper frame, with a movable cross-bar, upon which is attached a three-arm catch for grasping the stopper. The primary object of this device is to take out, and put in, the stopper while the bottle is under water. The de-

Digitized by Google

vice was given weight by suspending from the bottom a boat-like sink with a copper keel to keep the mouth of the bottle upstream.

The bottle was placed in the frame, the arms of the catch being brought over the tin foil and under the cap of the bottle. The tin foil was lifted carefully from the neck and allowed to remain in a horizontal position. The complete device was lowered by means of a heavy string, and when it reached the required depth, the stopper was lifted by means of the lighter string. When the bottle was filled, judging by the air bubbles, the light string was released, thus allowing the stopper to fall into place. The tin foil was carefully replaced over the neck of the bottle after it was drawn out of the water.

The sample collected from the intake by Mr. Charles Jacob, B. E., was collected with a similar apparatus, made by the collector. In all cases except where stated the samples were collected eighteen inches below the surface.

Technic and Procedure Adopted.

Samples were collected at the places mentioned above at about the same time every morning in order to make the data comparable. All samples were examined as soon as possible, in all cases within two hours after collection. In the beginning of the investigation the samples were packed in ice immediately after collection, remaining there until plated. After January 15, 1913, the count reduced considerably, placing the most contaminated water in the fairly pure surface water class. The difference between the air temperature and the water temperature varied only a few degrees. In view of these two facts, the ice packing was abandoned, but in all cases the samples were plated within two hours.

Bacterial Counts.

Preliminary tests, with samples from each location, were made in order to obtain the dilutions which would give a count varying from 25 to 200 colonies.

The dilutions used in examining the water from the intake were 0.1 and 0.01 c. c. Duplicate plates were made from the 0.1 c. c. dilution. These dilutions were used throughout the in-

Digitized by Google

vestigation, as there was no change in the count which caused the number of colonies on any plate to fall outside the stated range. No special difficulties were experienced with spreading colonies interfering with counting. There was a spreader encountered very often, but the growth was so thin that it did not hinder the counting.

The water from Spain street was plated from January 6 to January 14, in amounts of 0.0005 and 0.0001 c. c., duplicate plates being made from the 0.0005 c. c. dilution. From the latter date until January 18, it was found necessary to make a dilution of 0.001 c. c. Beginning on February 10, and continuing until February 24, the water was plated in amounts of 0.01 and 0.001 c. c., with a duplicate plate from the 0.01 c. c. dilution. From then until the end of the investigation the amounts used were 0.1 and 0.01 c. c., with a duplicate plate from the 0.01 c. c. dilution. No difficulties were experienced with spreading colonies interfering with counting.

The water from Clouet street was plated in amounts of 0.1 and 0.01 c. c., with a duplicate plate from the latter dilution. These counts were used throughout the investigation, as the number of colonies on any plate remained well within the fixed bounds.

In all cases the dilutions were plated in nutrient agar, prepared in accordance with the report of the Committee on Standard Methods of Water Analysis to the Laboratory Section of the American Public Health Association, 1912. Plates were counted after incubation for 24 hours at 37° C. The count recorded was the average count of the different dilutions; if there was a large difference in the number of colonies per cubic centimeter obtained from the dilutions, the count was then taken as the average of the lowest dilutions.

The bacterial counts were correct for significant figures as follows:

Digitized by Google

Number of Colonies—	Recorded to Nearest Unit
1 to 50	5
51 to 100	10
101 to 250	25
251 to 500	50
501 to 1,000	100
1,001 to 10,000	500
10,001 to 50,000	1,000
50,001 to 100,000	10,000
100,001 to 500,000	

Determination of Presence and Number of B. coli.

Preliminary tests were made with water from each location, in order to obtain the dilutions, which would give at least two Smith tubes with, and one without, gas.

The dilutions made from the water from the intake, suitable for the acquirement of the above conditions, were: from January 6 to 20, 10, 1, and 0.1 c. c., after this only 1 and 0.1 c. c. were used.

The water from Spain street was used in the amounts of 0.001 and 0.0001 c. c. from January 6 to 16. The dilutions were then diminished until February 19, from there on 1, 0.1 and 0.01 c. c., with an occasional 0.001 c. c.

The water from Clouet street was used in amounts of 1 and 0.1 c. c. on January 6 and 7, from then until February 11 an increase to 0.01 and 0.001 c. c. was made. After the latter date and until the end of the investigation, the amounts used were 1, 0.1 and 0.001 c. c.

In all cases the dilutions were planted into fermentation tubes containing lactose bile prepared in accordance with the report of the Committee on Standard Methods of Water Analysis to the Laboratory Section of the American Public Health Associatian, 1912. The tubes were then incubated for 72 hours, the amount of gas being read at the end of 24, 48 and 72 hours. As soon as gas appeared, which was about 24 hours, a loopful of the liquid from the bottom of the tube, containing the smallest dilution, and in which gas had been formed, was transferred to a tube containing about 20 c. c. of sterile water, and mixed thoroughly. One c. c. of this mixture was plated in litmus-

Digitized by Google

lactose-agar. This method was found to be more satisfactory than the "streaking method," because individual colonies were formed, which facilitated the fishing of a red colony, and avoided the contamination of the red colony by other organisms. In other words, a practically pure culture was obtained. After incubation for 24 hours at 37° C., one of the characteristic red colonies was fished out, and planted into standard nutrient broth.

The broth was incubated for 24 hours at 37° C., at the end of which the condition of the growth was noted. A loopful of this broth was planted into each of the following media:

1. Agar slant.
2. Gelatine slant.
3. Litmus milk.
4. Lactose broth.
5. Peptone water.
6. Neutral red broth.

All of these tubes were incubated at 37° C., with the exception of gelatine, which was incubated at 20° C., and the changes noted at different lengths of time.

The agar slant was examined after 24 hours, and the nature of the growth noted. From this culture a hanging drop was made from which the motility of the organism was observed. A smear was made and stained with Gram's stain, being counterstained with saffranin. From this smear, the form and the action of Gram's stain on the bacillus was determined.

The appearance of the growth on the gelatine slant was observed, after incubation at 20° C. for four days, but the tubes were allowed to remain in the incubator for ten more days in order that the liquefying properties of the bacillus might be obtained.

At the end of 48 hours the litmus milk was examined for its acidity, and also for coagulation. It was allowed to incubate for twelve days more, the condition of the curd then being noted.

The amount of gas formed in the tube containing lactose broth was observed at the end of 48 hours, at the same time the amount of CO_2 formed, and its acidity, were determined.

After four days of incubation the peptone water was tested for the presence of indol.

Digitized by Google

Neutral red broth was examined after 48 hours, the amount of gas formed was measured, its acidity determined, and it was observed whether the greenish fluorescence was present.

This method for the study of the cultural and bio-chemical characteristics of *B. coli* is the one recommended by the report of the Committee on Standard Methods of Water Analysis to the Laboratory Section of the American Public Health Association, 1912, with the exception of the addition of neutral red broth. All media used in the investigation are in accordance with the above standard, with the exception of neutral red, which was prepared as recommended by Savage. It consists of a liter of standard dextrose broth to which has been added 12 c. c. of a saturated solution of neutral red.

Significance of the Term B. coli.

In accordance with the American Public Health Committee the term *B. coli* signifies a group rather than a specific species of bacteria. As all of the members of this group are so closely related, and as their natural habitat is the intestines of man and warm-blooded animals, any of these varieties should be considered to give the same amount of sanitary significance.

It may be stated at the outset that no attempt was made to record separately the occurrence of the various members of the colon group. The term *B. coli* is employed here to designate in a general sense the whole colon group. Any organism which formed gas in lactose bile, acid and gas in lactose and dextrose broth, was a short rod bacillus, Gram's stain negative, and did not lequify gelatine in fourteen days, was considered a *B. coli.*

Some Results of Different Tests for B. coli.

From the intake water twenty-one *B. coli* determinations were made. In all cases except one, gas was present in the selected dilution. In the twenty-one determinations *B. coli* was absent, in one cubic centimeter, only four times, or about 19%. But on three of these days *B. coli* was isolated from 10 c. c. by Mr. Charles Jacob, B. E., making it present, in the above water, in 95% of the samples examined. In the four cases

Digitized by Google

which showed its absence in 1 c. c. of water, gas was present three times, once over 25% and twice under 10.

During the whole investigation sixty-seven determinations were made, and out of these, ten tubes containing lactose bile failed to show gas, due to the dilutions not being suitable to the occasion.

When the gas formed was over 25%, *B. coli* failed to be isolated only once. In the 57 complete determinations, the absence of *B. coli* in 1 c. c. was demonstrated only five times, four of these cases are explained above, the other was from a tube containing 17% of gas, and 1 c. c. of water from Clouet street. Therefore, if lactose bile alone had been used as a presumptive test, and considering 25% gas as an indicative of *B. coli*, the error would have been only 1 in 57, or 1.76%.

In the beginning of the investigation dilutions were seeded in liver broth, made in accordance with the report of the Committee on Standard Methods of Water Analysis to the Laboratory Section of the American Public Health Association, 1912. In several tests made *B. coli* was not isolated from 1 and 0.1 c. c. of water taken at the intake, while on the same days it was present in the same dilutions planted in lactose bile. The original idea was to record the presence and number of attentuated *B. coli*, but due to the above conditions this idea was abandoned.

The production of acid and coagulant in litmus milk proved of little value, as no organism giving the other tests for *B. coli* failed to give these reactions.

In all cases where *B. coli* was isolated, acid and gas were formed in lactose broth, but the amount of gas formed was quite variable. The amount varied from 5 to 65%, with about 30% as an average. By making an allowance for error in recording gas formation, of 3% on each side of the recorded amount of CO_2, the ratio of CO_2 to the total gas formed was nearly constant, being 1 to 2.

When tested for indol as specified by the Committee on Standard Methods of Water Analysis, none of the organisms which gave all other characteristics failed to give indol.

From January 6 until February 10, neutral red broth was not used, but from the latter date until the end of the investiga-

Digitized by Google

tion it was used as a differential media, and for the determination of the amount of gas formed in dextrose. In all cases where the sought-for organism was isolated, gas and acid were formed. The greenish fluorescence was absent in 17.9% of the tests made.

In no case where an organism giving the characteristic tests of *B. coli* was the liquefaction of gelatine noted.

All cases where the other characteristics of *B. coli* were positive, the form, motility and Gram's stain action were also positive.

The cultural characteristics were quite uniform. In only one case was the cultural characteristic on an agar slant, the determinative factor.

Discussion of Data.

The relation between stage of river, turbidity, bacterial count and *B. coli* per cubic centimeter.

The records of the stage of the river were obtained from the United States Weather Bureau, and were taken from the Canal street gauge, which has its zero 2.5 feet below mean Gulf level.

Through the courtesy of the officers in charge of the New Orleans water purification plant it was possible to obtain turbidity data for the days on which samples were collected. These records, however, could only be used in connection with the water taken from the intake. They were determined by Weston's diaphanometer, and are expressed as parts of silica per million.

The method of obtaining the bacterial count, and the number of *B. coli* per cubic centimeter have already been explained. This term "*B. coli* per cubic centimeter" is rather broad, but means simply this: for instance, if gas was formed in a tube of lactose-bile containing 0.01 c. c. of water, no gas being formed in any other tube containing a greater dilution of the same water, and the organism isolated from the above tube was found to be a *B. coli*, then the number of "*B. coli* in one cubic centimeter" of this water was recorded as 100.

Considering the water from the intake, the stage of the river, turbidity, bacterial count and the number of *B. coli* per cubic centimeter were found to be low, between January 6 and 13. But on January 14 a marked rise in the river took place,

Digitized by Google

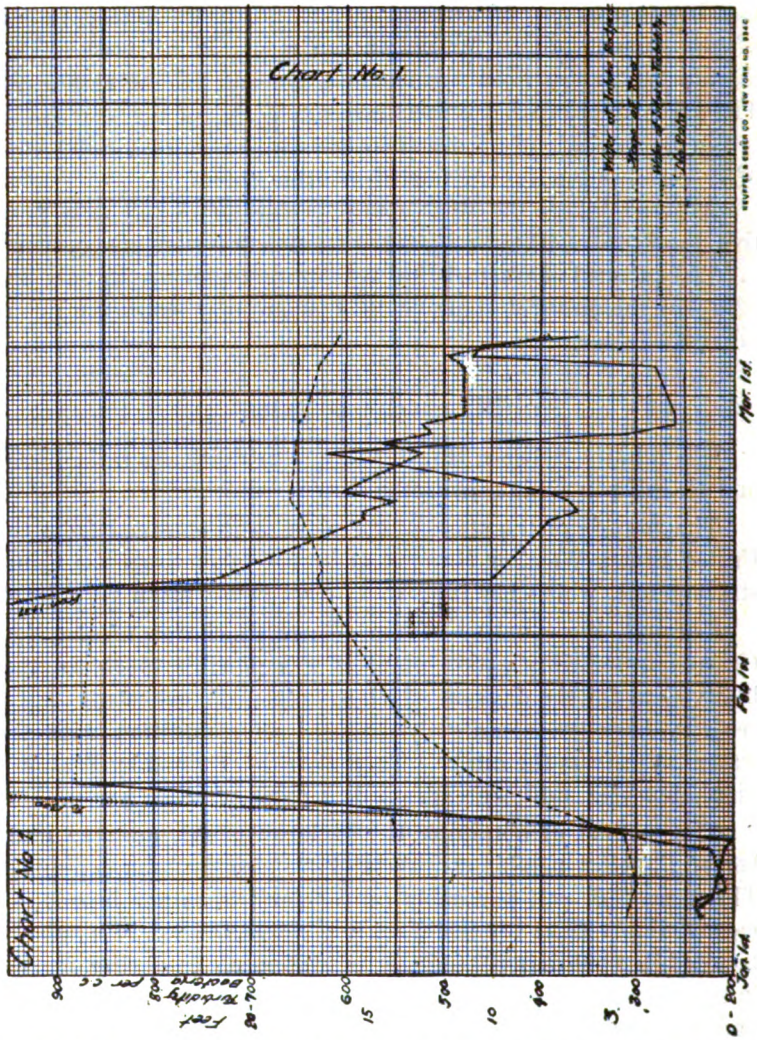


Chart No. 1 gives a graphical picture of the relation between the bacteria per c.c., stage of river, and the turbidity of the Mississippi River water taken from the intake pipe at the New Orleans Water Purification Plant. Three curves are plotted, one for each of the above factors. A dotted line in a curve indicates that no data was collected.

Digitized by Google

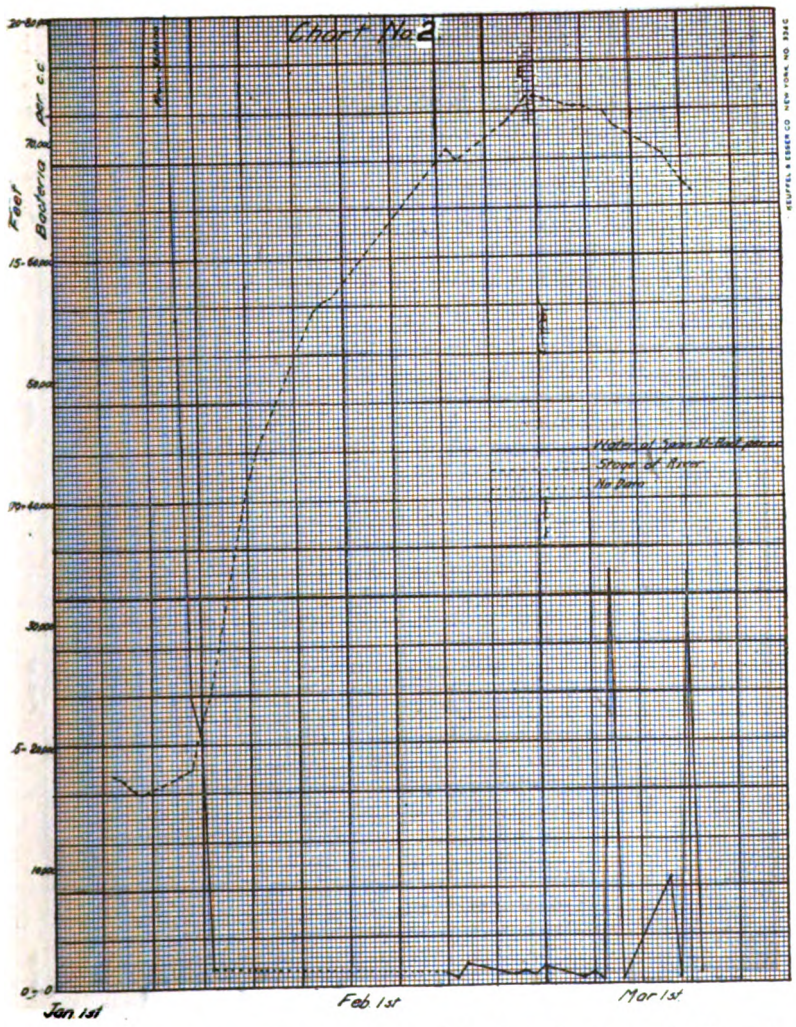
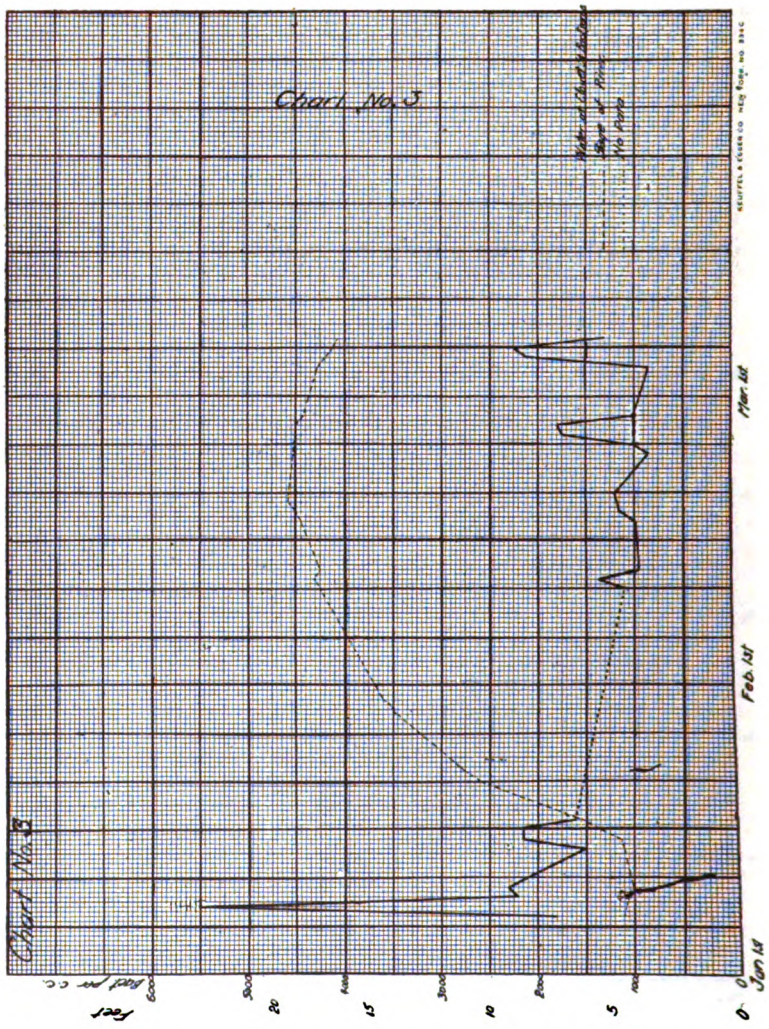


Chart No. 2 shows two curves, one of the bacteria per c.c., in the water from Spain Street, and the other the stage of the river. The very striking effect of the increase in the volume of the river water is brought out clearly by these two curves.

and continued until February 27, causing an increase in the turbidity, bacteria and *B. coli* per cubic centimeter. From the latter date until the end of the investigation the stage of the

Digitized by Google



On Chart No. 3 the water from Clouet Street is considered. Two curves are plotted, one of the bacterial count, and the other of the stage of river.

river was on the decrease, causing in turn a decrease in the above factors. Evidently, the bacterial count and the number of *B. coli* per cubic centimeter are quite uniformly proportional to the turbidity of the water. The increased turbidity was, prob-

Digitized by Google

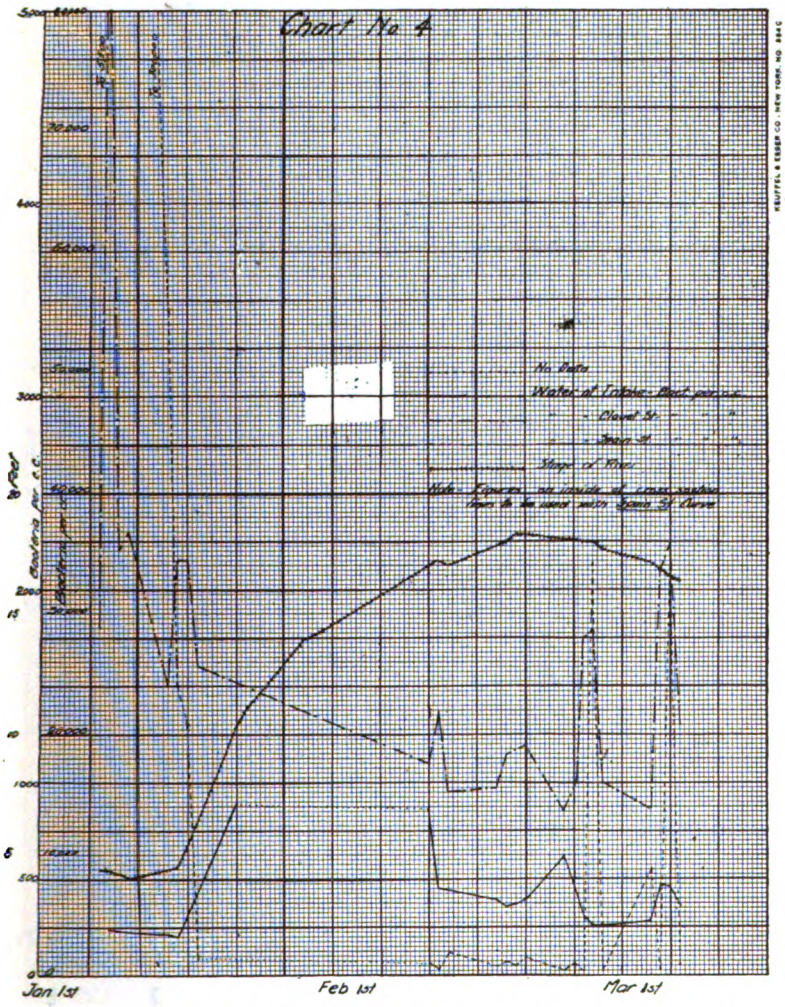


Chart No. 4 shows all of the curves previously plotted, presenting a simple picture so as to be able to compare all of the conditions existing at all places where samples were collected. It was impossible to plot all of the curves to the same scale, due to the great range of the bacteria per c.c., but in order to have all of them on the same plate, a separate scale was made and placed within the cross-section lines, to be used with the curve showing the bacteria per c.c. in the water from Spain Street.

Digitized by Google

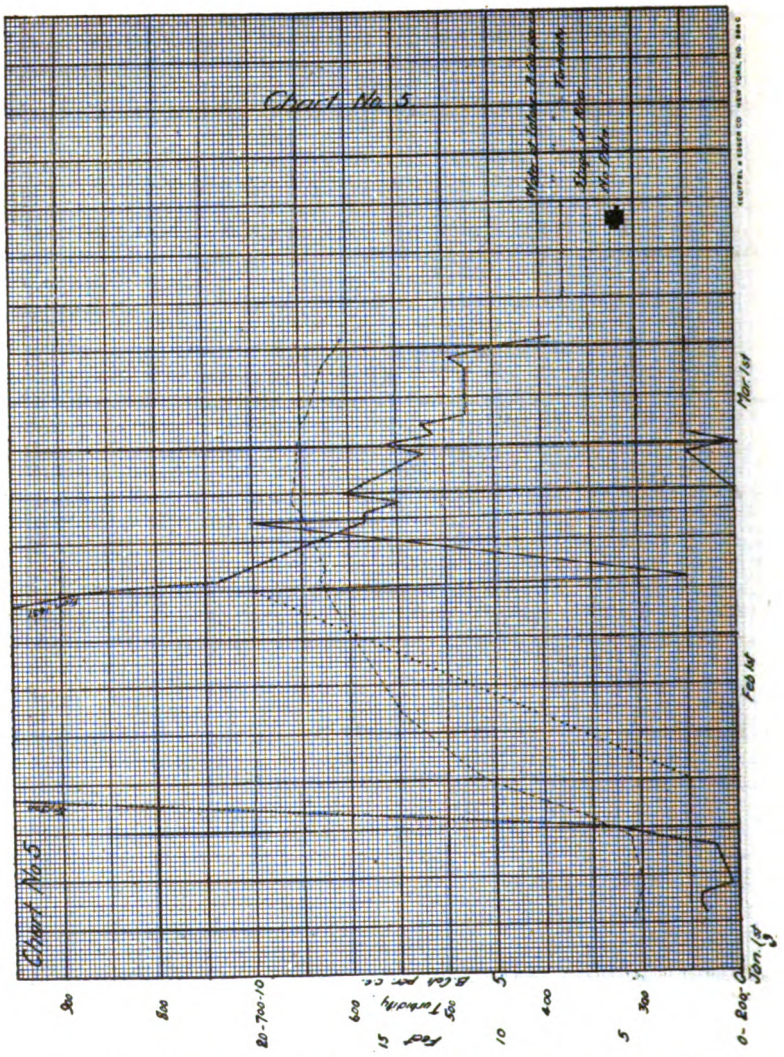


Chart No. 5 shows the relation between the number of B. coli per c.c. stage of the river, and the turbidity of the water from the intake. Three curves are plotted, one for each of the above factors.

ably, due to an increase in the velocity, thereby allowing the vehicle to carry more solid matter in suspension. This increase

Digitized by Google

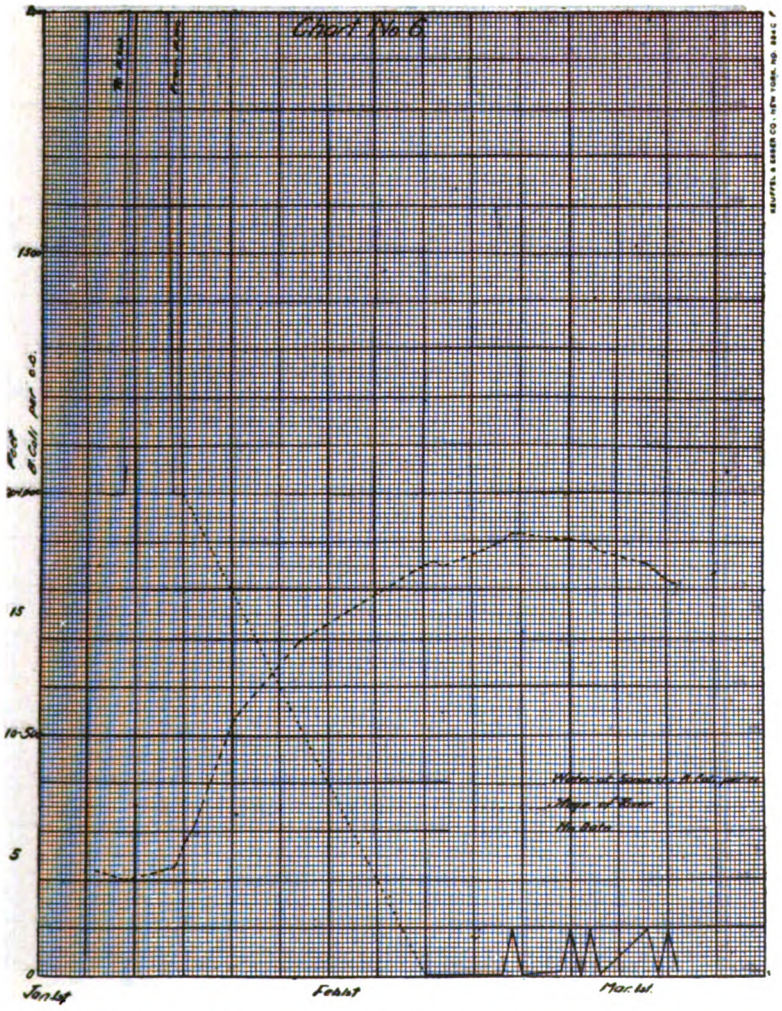


Chart No. 6 shows two curves, one of the B. coli per c.c. in the water at Spain Street, and the other, the stage of the river. It shows well the effect of the different stages of the river on the number of B. coli present in one c.c. of the water.

in the matter held in suspension no doubt came from the stirring up of the particles at the bottom and sides of the river's bed. Carried with these particles were numbers of bacteria,

Digitized by Google

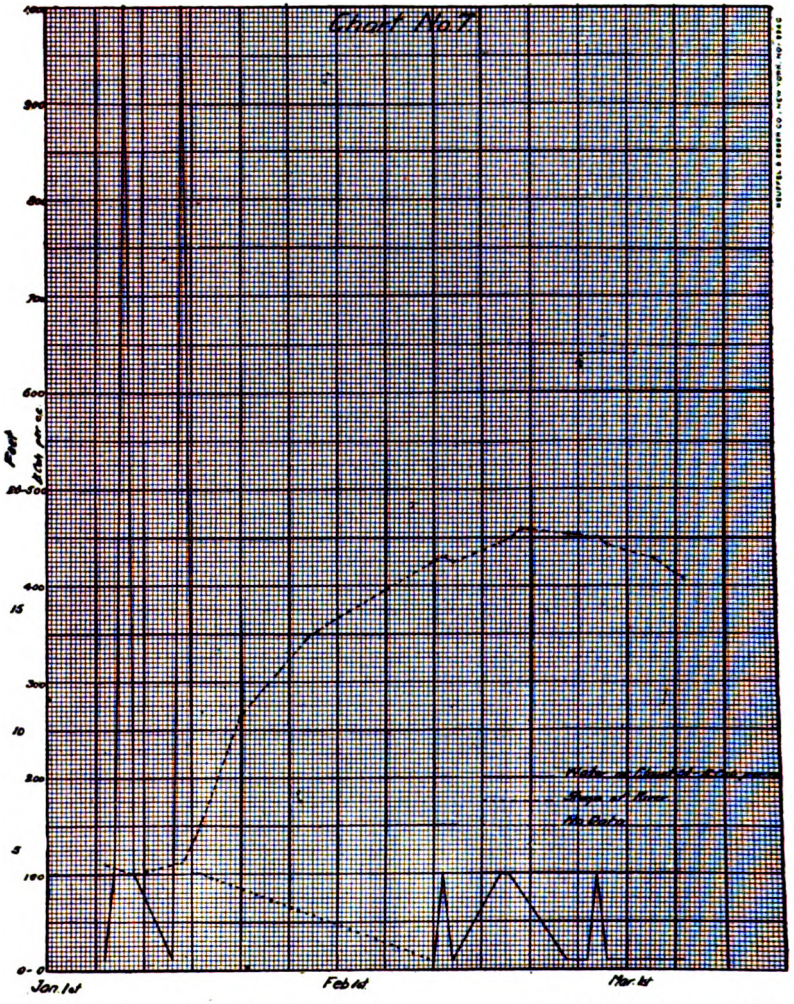


Chart No. 7 shows by the aid of two curves a graphical picture of the relation between the stage of the river and the number of B. coli c.c. in the water from Clouet Street. In all of the curves the daily variations are brought out, and in order to draw any conclusions from them the general slope must be considered.

and among them *B. coli*, which gave rise to the increase in both the bacterial count and the number of *B. coli* per cubic centimeter.

Digitized by Google

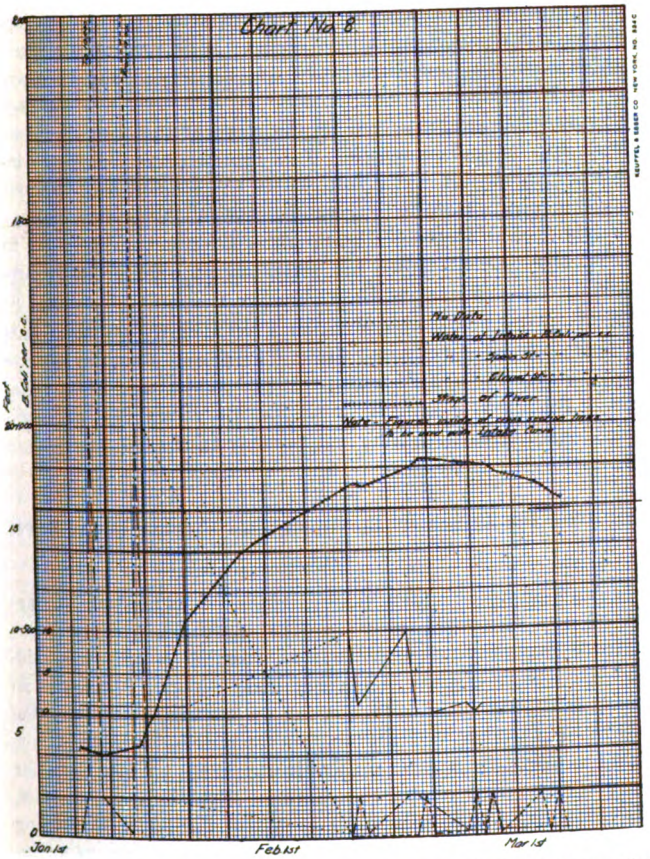


Chart No. 8 shows all of the curves, which bear relation to the number of B. coli per c.c. in the water collected from the three selected places, and also two other curves, one of the turbidity of the water from the intake, and the other of the stage of the river. This Chart presents a concise picture of all the effects occurring at the above places.

This, however, was not the case at Spain and Clouet streets. From January 6 until January 13, the river, as stated above, was low, but the bacterial count and the number of *B. coli*

Digitized by Google

per cubic centimeter were very great, this being directly opposite to the conditions at the intake. With a rise in the river, which took place on January 14, and continued until February 27, both the bacteria and *B. coli* per cubic centimeter showed a remarkable decrease, but as the stage of the river decreased these two factors increased. This decrease was due to the increased volume of water into which the effluent was discharging, thereby affording a greater dilution. Therefore, it may be stated that the bacteria and *B. coli* per cubic centimeter in the water at and below the sewer outlet were inversely proportional to the stage of the river.

All of the foregoing discussion is based on the average counts and *B. coli* per cubic centimeter. There were a number of days when these quantities showed quite a sudden and great variation. Such variations are, of course, due to the varying conditions existing in the river, and possibly to the imperfections in the technic of estimation.

Sanitary Conditions in the Immediate Vicinity of the Sewer Outlet.

From an esthetic standpoint, the conditions existing here are in no way offensive. It is true that during low stages of the river a dark stream could be seen running out towards midstream, but in a short distance it disappeared. Practically no solid matter could be seen floating on the surface, because the enormous dilution that the sewage receives before entering the river causes this matter to be disintegrated. When the river was high no sign of discolored water could be seen. In fact, it would have been impossible to locate the outlet by relying solely on the physical changes in the water to serve as an indicator of its position.

Comparison of the Mississippi River Before and After Pollution.

This comparison could be made from a study of the data obtained from the water taken at the intake and Clouet street, but the writer has, for convenience, endeavored to show the effects by the use of a comparative table. The table consists of

Digitized by Google

both the bacterial counts, and the *B. coli* estimations of every sample collected at the above places, and the per cent. increase of these two factors in the water from the latter place, over those from the former.

Comparative Table.

DATE—	—INTAKE—		—CLOUET ST.—		Per cent. increase Bact. per c. c. Clouet Street over Intake	Per cent. increase B. coli per c. c. Clouet Street over Intake
	Bact. per c. c.	B. coli per c. c.	Bact. per c. c.	B. coli per c. c.		
1/7	235	1	5500	100	2235	9900
1/8	225	1	2200	1000	878	99900
1/13	210	1	1500	10	615	900
1/14	200	1	2150	1000	975	99900
2/10	860	10	1100	10	28	00
2/11	450	1	1350	100	200	9900
2/17	390	10	975	100	150	900
2/18	360	0	1150	100	219	10000
2/20	390	0	1200	10	208	1000
2/24	620	1	850	10	37	900
2/25	470	0	1000	10	113	1000
2/26	310	1	1740	10	460	900
2/27	260	1	1800	100	593	9900
2/28	260	1	1000	10	285	900
3/3	280	1	860	10	207	900
3/4	470	1	2100	10	347	900
3/5	460	1	2250	10	389	900
3/6	360	1	1300	10	261	900

Considering the low stage of the river to last until January 14, and taking an average of the two recorded per cents., it was found that the average per cent. increase of bacteria per cubic centimeter in the water from Clouet street over that of the intake was 1178, and the average per cent. increase of *B. coli* per cubic centimeter from the latter over the former was 54,400. These increases appear quite large, especially when the distance downstream of the place where the samples were taken, and the volume of the Mississippi, are taken into consideration.

Digitized by Google

During the high stage of the river, a considerable effect was noted, due to the increased volume of river water. The average per cent. for high stage of the first factor was 250, and of the second 2,785, or a decrease from low to high stage of 928% in the first case, and 51,615% in the second.

There is a section in the extreme eastern part of the city, the sewage of which is pumped from Station B into the river at the head of Jourdan avenue. But inspection of the district shows that the amount of sewage pumped is small, due to the scant population, making it necessary for sewering only a portion of this section. For this reason the station pumps for about an hour each day, except during the wet season, when it takes care of seepage water. Three samples were collected within about 250 feet of this sewer outlet, and from these the condition of the water was found to be about the same at that at Clouet street. The significance of the results obtained from these samples is small, because in such a short distance very little mixing could have taken place. The results are as follows:

DATE	Bact. per c. c.	B. coll per c. c	Remarks.
2/15	990	100	
3/2	930	10	Pumping Station Not Pumping.
3/10	2830	10	

The Low Count at the Sewer Outlet.

The maximum count of 300,000 bacteria per cubic centimeter occurred during the low stage of the river, and at no other time was the amount anywhere near this. In fact, the count became so low at times that the quality of the water was nearly the same as that from the intake.

At first it was thought that this low count was due to the

Digitized by Google

addition of chemicals to the sewage by industrial institutions, but upon testing a sample from each of the pumping stations, it was found that all were about neutral, using phenolphthalein as an indicator, and that the number of bacteria and *B. coli* per cubic centimeter was about the same as in sewage tested from other American cities. The following table gives the results obtained:

Pumping Station Number	Date	Temp. of Sewage, Degrees F.	Bact. per c. c.	B. coli per c. c.	Reaction
A*	2/13	....	273,000	100,000	Neutral
A	3/11	73	1,730,000	1,000,000	Neutral
9	3/13	66	366,000	10,000	Neutral
14	3/13	66	3,310,000	100,000	Neutral
15	3/13	67	3,310,000	1,000,000	Neutral
6	3/13	66	833,000	10,000	Neutral
1	3/13	66	10,000	1,000	Neutral
8	3/13	66	1,666,000	100,000	Neutral

*Main Pumping Station.

Several of these tests showed exceptionally low counts for sewage, but it is possible to make an explanation for each. The first sample taken from the main pumping station A gave a count of only 273,000 bacteria per cubic centimeter. This exceptional count was due to a great dilution caused by a rainy spell a few days before the collection of the sample.

The samples taken from sub-station No. 1 showed a very remarkably low bacterial count. But an examination of the map showed that the area which supplies the sewage for this station is comparatively small, and of a residential character. Half of the main sewer is beyond Dante street, running through an unsewered district, and carrying only the seepage water. Most of the streets in this section are not paved, which allows a great portion of the rain water to percolate through the surface soil and to be carried away as seepage. Twenty-four hours

Digitized by Google

TABLE No. 1.—SUMMARY OF DATA

Source of Water, Mississippi River at Head of Clouet Street, 2200 Feet from Sewer Outlet at Spain Street.

Date Exam.		No.	Temp. of Water °F.	Stage of River	No. Bact. Per C. C.	Percentage of Gas Formed in Lactose Bile After 72 Hours: 1cc.	.1cc.	.01cc.	.001	Milk: Acid	Coag.	Coag. Perm. 14 das.	Lactose Broth: Gas % 48 hrs.	Acid 48 hrs.	CO_2 48 hrs.	Indol	Neutral Red: Gas % 48 hrs.	Acid 48 hrs.	Nuet. Red. React.	Gel. Liq. 14 days	Gram's Stain	B. Coli in 1cc.
1-6	1	55	55	4.4	1800		80		0	x	x	x	42	x	15	x						10
1-7	2	51	51	4.3	3500		65	52	0	x	x	x	35	x	13	x						100
1-8	3	47	47	4.2	2200			75	55	x	x	x	47	x	22	x						1000
1-9	4	47	47	4.0	2300				55	x	x	x	38	x	13	x						10*
1-13	5	48	48	4.4	1500				0	x	x	x	35	x	15	x						100
1-14	6	48	48	4.5	2150				60	x	x	x	40	x	20	x						1000
1-15	7	49	49	5.4	2150				15	x	x	x	42	x	17	x						100
1-16	8	49	49	6.1	1600				60	x	x	x										100
2-10	9	46	46	10.3	1100				35	x	x	x										100
2-11	10	46	48	17.0	1100				0	x	x	x	33	x	10	x						100*
2-12	11	48	48	17.2	1350		65	65	32	x	x	x	12	x	2	x	42	x	x			100
2-17	12	48	48	17.0	950		15	15	00	x	x	x	35	x	15	x	15	x	x			10
2-18	13	47	47	17.8	975		39	39	100	x	x	x	30	x	7	x	35	x	x			100
2-19	14	46	46	18.0	1150		65	65	60	x	x	x										100
2-20	15			18.3					0													
2-24	16	47	47	18.3	1200				0													10*
2-25	17	48	48	18.1	850	100	62	0	0	x	x	x	38	x	8	x	35	x	x			100
2-26	18	45	45	18.1	1000	100	75	0	0	x	x	x	46	x	18	x	52	x	x			10
2-27	19	45	45	18.0	1740	85	67	0	0	x	x	x	30	x	10	x	30	x	x			100
2-28	20	47	47	18.0	1800	75	58	0	0	x	x	x	45	x	15	x	18	x	x			10
3-3	21	51	51	17.7	1000	47	58	0	0	x	x	x	30	x	10	x	30	x	x			100
3-4	22	49	49	17.1	860	78	95	0	0	x	x	x	15	x	5	x	20	x	x			10
3-5	23	49	49	16.8	2100	90	67	0	0	x	x	x	23	x	10	x	20	x	x			100
3-6	24	49	49	16.5	2250	90	90	5	0	x	x	x	35	x	18	x	37	x	x			10
	25	50	50	16.3	1300	90	65	00	0	x	x	x	18	x	11	x	27	x	x			10

* Indicates that B. coli was probably present in the stated number.

Table 1 contains the complete data obtained from tests made with the water from the intake, Spain and Clouet Streets. The results obtained from the differential media are expressed when positive by the x sign, and when negative by the — sign.

before this sample was collected there was a very heavy shower, which caused, in combination with the above fact, a great volume of seepage water to flow in the pipes, and in turn diluted the sewage enormously.

The bacterial count of the sewage from both sub-stations 9

Digitized by Google

and 6 were also very low in comparison with those obtained from samples collected elsewhere, but conditions similar to the above exist in both of the districts furnishing sewage to these stations.

There is no doubt that the sewage from the City of New Orleans is very greatly diluted in comparison with that from other cities of about the same size, but this, however, is not surprising, because conditions here afford every means for an enormous dilution even before the effluent reaches the river. This city owns its own water works, making it possible to allow the consumer one-third of the water used for sewage and waste purposes. Then, again, the city is spread over a large area, which made it necessary to construct long lines of mains and laterals, through a soil which is ideal for the percolation of rain water.

Later, it was concluded that this low bacterial count of the water at the sewer outlet was also influenced by the position of the location from which the samples were collected. The sewage is pumped from the main pumping station, through a 48-inch force main, the discharge end of which is situated 60 feet below and 28 feet outstream from the edge of the wharf. It is fitted with a flexible joint that always keeps the opening of the pipe downstream, and the flow of the sewage in the currents of the river. These carried the sewage downstream at such a rapid rate that it was impossible for it to mix, to any extent, with the river water, within the distance between the end of the pipe and the location of collection. Then, again, the river has a slight bend just here, that diverted the sewage-bearing currents midstream, and farther from the place from which samples were collected. Therefore the conclusion stated above was based upon these existing conditions. No doubt a considerable amount of the sewage was mixed with the water, because the general run of the fluctuation of the curves for both the bacteria and *B. coli* per cubic centimeter were similar to those of Clouet street, which has been explained, as being on a direct line with the direction of the sewage laden currents, and at a sufficient distance downstream to allow the mixing of the sewage with the river water. In view of this low count, and the reasons for same,

Digitized by Google

TABLE No. 2.—SUMMARY OF RESULTS

Source of Water, Mississippi River from New Orleans Water Supply Intake at Foot of General Ogden Street.

Date Exam.	No.	Temp. Water	Stage of River	Turbidity Pts. per Million	No. Bact. per C. C.	Per Cent. Gas Formed in Lactose Bile After 72 Hours			Milk			Lactose Broth			Indol	Neutral Red			Gelatine Liq. 14 Days	Gram's Stain	B. Coli in 1 c.c.
						10cc	1cc	.1cc	Acid	Coag.	Coag. Perm. 14 da.	Gas Per Cent. 48 hrs.	Acid 48 hrs.	CO2 48 hrs.		Gas Per Cent 48 hrs.	Acid 48 hrs.	Neut. Red React.			
1-6	1	55	4.4	234	.....	.....	.....	.....	...	...	...	...	...	...	...	.....	...	...	...	—	...
1-7	2	51	4.3	238	235	55	65	.....	x	x	x	40	x	10	x	.....	...	...	—	—	1
1-8	3	47	4.2	238	225	70	60	.....	x	x	x	45	x	15	x	.....	...	...	—	—	1
.....	4	47	4.0	205	.....	.....	.....	.....	...	...	...	...	...	...	...	.....	...	...	...	...	...
1-13	5	48	4.4	224	210	60	20	.....	x	x	x	47	x	12	x	.....	...	...	—	—	1
1-14	6	48	4.5	287	200	65	30	.....	x	x	x	45	x	30	x	.....	...	...	—	—	1
.....	7	49	5.4	328	.....	.....	.....	.....	...	...	...	...	...	...	...	.....	...	...	...	...	...
.....	8	49	6.1	398	.....	.....	.....	.....	...	...	...	...	...	...	...	.....	...	...	...	...	...
1-20	9	47	10.3	1300	880	75	100	0	x	x	x	33	x	13	x	.....	...	...	—	—	1
2-10	10	46	17.0	878	860	.....	05	55	x	x	x	40	x	13	x	27	x	x	—	—	10
2-11	11	48	17.2	732	450	.....	70	0	x	x	x	35	x	10	x	40	x	x	—	—	1
.....	12	48	17 0	714	.....	.....	.....	.....	...	...	...	...	...	...	...	.....	...	...	...	...	...
2-17	13	47	17.8	583	390	.....	68	62	x	x	x	37	x	15	x	35	x	x	—	—	10
2-18	14	46	18.0	583	360	80*	14	10	x	x	x	30	x	...	x	40	x	x	—	—	0
2-19	15	...	18.3	547	370	85*	00	00	x	x	x	25	x	...	x	30	x	x	—	—	0
2-20	16	47	18.3	603	390	.....	30	00	x	x	x	8	x	0	—	50	x	x	x	—	0†
2-24	17	48	18.1	520	620	.....	90	38‡	x	x	x	5	x	0	x	25	x	—	—	—	1
2-25	18	45	18.1	565	470	75*	5	0	x	x	x	40	x	...	x	35	x	x	—	—	0
2-26	19	45	18.0	511	310	.....	100	0	x	x	x	28	x	10	x	30	x	x	—	—	1
2-27	20	47	18.0	520	260	.....	75	0	x	x	x	20	x	5	x	28	x	x	—	—	1
2-28	21	51	17.7	479	260	.....	60	0	x	x	x	30	x	10	x	30	x	—	—	—	1
3-3	22	49	17.1	479	280	.....	65	0	x	x	x	28	x	10	x	35	x	x	—	—	1
3-4	23	49	16.8	495	470	.....	60	0	x	x	x	25	x	—	x	15	x	x	—	—	1
3-5	24	49	16.5	450	460	.....	70	0	x	x	x	10	x	3	x	100	x	x	—	—	1
3-6	25	50	16.3	390	360	.....	90	0	x	x	x	8	x	3	x	30	x	x	—	—	1

* Isolated by C. Jacob, B. E., from 10 cc. 1 cc and 0.1 cc showed no red colonies on L. L. Agar.

† Growth on Agar slant was yellow.

‡ No red colonies on L. L. Agar.

Table 2 contains the complete data obtained from tests made with the water from the intake, Spain and Clouet Streets. The results obtained from the differential media are expressed when positive by the x sign, and when negative by the — sign.

it may be stated that the position of the sewer outlet has been well selected, and that its efficiency is correspondingly great.

Increased Pollution of Mississippi River Water at the Intake Pipe.

In the water purification investigation carried on during 1900-01 by Robert Spurr Weston, for the New Orleans Sewerage

Digitized by Google

TABLE No. 3.—SUMMARY OF DATA

Source of Water, Mississippi River 50 Feet Downstream from Sewer Outlet at Head of Spain Street.

Date Exam.	No.	Temp. of Water °F.	Stage of River	No. Bact. per C. C.	1cc.	.1cc.	Per Cent Gas Formed in Lactose Bile After 72 Hours: .01cc.	.001cc.	.0001cc.	.00001cc.	Milk: Acid	Coag. *	Coag. Perm. 14 days	Lactose Broth: Gas % 48 hrs.	Acid 48 hrs.	CO_2 48† hrs.	Indol	Neutral Red: Gas % 48 hrs.	Acid 48 hrs.	Nuet. R. React.	Gel. Liq. 14 days	Gram's Stain	B. Coli in 1c.c.
1-6	1	55	4.4					50	0		x	x	x	35	x								1,000
1-8	2	51	4.3	300,000																			
1-9	3	47	4.0					60	0					45	x	15	x						
1-13	4	47	4.2											45	x	8	x						1,000
1-14	5	48	4.4	55,000				70	0		x	x	x	32	x	35	x						10,000
1-15	6	48	4.5	24,000				82	0					65	x	15	x						1,000
1-16	7	49	5.4	20,750				0	0	0				35	x	15	x			-			1,000
1-	8	49	6.1	1,500				47	0		x	*											
1-16	9	47	10.3					0	0	0													
2-10	10	46	17.0	900		0	0	0	0	0	x	x	x										1,000
2-11	11	48	17.2	700		0	0	0	0	0													1,000
2-12	12	48	17.0	1,800		0	0	0	0	0													1,000
2-17†	13	47	17.8	850		12	0	0	0	0													100
2-18	14	46	18.0	1,200		0	0	0	0	0													100
2-19	15	45	18.3	850	80	0	0	15	0	0	Showed negative on Litmus Lactose Agar												10
2-20	16	47	18.3	1,500	75	0	0	0	0	0				28	x	13	x	40	x	-			100
2-24	17	48	18.1	550	100	48	0	0	0	0				48	x	18	x	50	x				1
2-25	18	45	18.1	930	90	42	0	0	0	0				35	x	5	x	48	x				100
2-26	19	45	18.0	430	17	1	0	0	0	0				35	x	12	x	45	x				100
2-27	20	47	18.0	34,100	100	85	0	54	0	0				38	x	13	x	40	x				100
2-28	21	51	17.7	450	63	0	0	0	0	0				25	x	13	x	35	x				1
3-3	22	49	17.1	8,800	85	84	0	77	0	0				37	x	12	x	30	x				100
3-4	23	49	16.8	625	55	0	0	0	0	0				28	x	12	x	15	x				1
3-5	24	49	16.5	861	80	95	0	80	0	0				15	x	8	x	12	x				100
3-6	25	50	16.3	850	65	75								33	x	13	x	33	x				10

* These reactions taken from a 0.001 dilution of water sown in Liver Broth.

‡ Indicates that B. Coli was probably present in the stated number.

† Samples on and after this date were collected 18′ below water surface; previous to this they were collected 18″ below surface.

Table 3 contains the complete data obtained from tests made with the water from the intake, Spain and Clouet Streets. The results obtained from the differential media are expressed when positive by the x sign, and when negative by the — sign.

Digitized by Google

and Water Board, "tests were made for *B. coli communis* during the flood season, that is, from December, 1900, to April, 1901. The volumes used for these tests varied from 1 to 300 c. c., and the bacilli were found only on three occasions during the five months, all during the first week in December. The presence of these organisms at this time only is explained by the fact that on the bank of the river immediately above the intake of the water purification station, where the samples were taken, a number of houseboat men and squatters were quartered. The feces deposited by them on the bank during the low season were probably washed out into the river at the time of high water, and this would account for the presence of *B. coli* in the samples. In all, 100 tests were made during the five months, and the general absence of *B. coli communis* leads to the conclusion that no unpurified sewage was present in the Mississippi River at New Orleans."

In the present investigation the tests for *B. coli* began on January 6, 1913, when the stage of the river was low (4.4 feet, Canal street gauge, zero of which is 2.5 feet below mean Gulf level), and continued to remain low until January 14. The stage of the river was, in fact, lower than the two months before and after December, 1900, the only month in which the above named investigator found *coli* present. He explains, as stated above, that their presence was due probably to a rise in the river which washed into it fecal matter deposited on the shore during low stage. This explanation cannot be given for their presence in 1913, because they were found when the river was at a very low stage. Then, again, its continued presence even after the river had risen shows that this pollution could not be accidental. In fact, the organism was isolated from 95% of the samples collected from the intake. The number of samples taken was small, but there were such variable conditions in the stage of the river, and such a great per cent. of the samples tested showed the presence of *B. coli*, that it is possible to conclude that the Mississippi River water at New Orleans is more polluted at present than it was in 1900 when Robert Spurr Weston made his investigation.

Digitized by Google

Summary of Results.

Practically all of the sewage from the City of New Orleans is emptied into the Mississippi River at the head of Spain street. This city having a bountiful supply of filtered water, allows one-thirds of the water consumed for the dilution and conveyance of the sewage, which in combination with the great rainfall, length of the sewer mains, and the nature of the soil, make the sewage receive a very great dilution before it reaches the river. The enormous volume of river water dilutes it to such an extent that no offensive effects, whatsoever, are encountered. Within a half mile of the sewer outlet, the increased bacterial count, and *B. coli* per cubic centimeter, are quite noticeable, but the stage of the river plays an important part in governing these factors.

Conclusions.

1. The bacterial count, and number of *B. coli* per cubic centimeter in the Mississippi River water taken from the intake pipe of the New Orleans water purification plant are directly proportional to the stage of the river, and the turbidity of the water.

2. The bacterial count, and the number of *B. coli* per cubic centimeter in the water at and below the sewer outlet are inversely proportional to the stage of the river.

3. The position of the sewer outlet pipe was well selected, and its efficiency correspondingly great.

4. From an esthetic standpoint, the conditions in the immediate vicinity of the sewer outlet are in no way offensive.

5. Within a half mile of the sewer, and during low stage of the river, a considerable increase in the bacterial count and the number of *B. coli* per cubic centimeter is encountered.

6. This increase is reduced to a great extent during high stages of the river.

7. The Mississippi River water at the intake of the New Orleans water purification plant is at present more polluted than when Robert Spurr Weston made his investigation in 1900.

Digitized by Google

Bibliography.

Leighton, Marshall O. Pollution of Illinois and Mississippi Rivers by Chicago Sewage. Water Supply and Irrigation Paper No. 194, U. S. Geological Survey, 1907.

Weston, Robert Spurr. Report on Water Purification Investigation, and on Plans Proposed for Sewerage and Water Works Systems. New Orleans Sewerage and Water Board, 1903.

Report of Committee on Standard Methods of Water Analysis to Laboratory Section of the American Public Health Association, 1912.

Lumsend and Anderson. The Origin and Prevalence of Typhoid Fever in the District of Columbia (1909-1910), Report No. 4 Hygienic Laboratory, Bulletin 78.

Reynolds, Arthur R. Report on Streams Examination, Chemic and Bacteriologic. December, 1902.

Sewerage and Water Board of New Orleans. Twenty-fourth Semi-Annual Report. December 31, 1911.

Weston, Robert Spurr. Laboratory Methods Used During the New Orleans Water Purification Investigation. Reprint from Proceedings of 30th Annual Meeting A. P. H. A., 1902.

Savage, William G. The Bacteriological Examination of Water Supplies.

Digitized by Google

MALTA FEVER IN LOUISIANA.

Report of a Positive Case in a Series of Forty-six Agglutination Tests with Microbacillus melitensis.*

CREIGHTON WELLMAN, M. D.,
ALLAN EUSTIS, M. D.,
and
S. S. SCHOCHET.
New Orleans.
(From the School of Hygiene, Tropical Medicine and Preventive Medicine, Tulane University.)

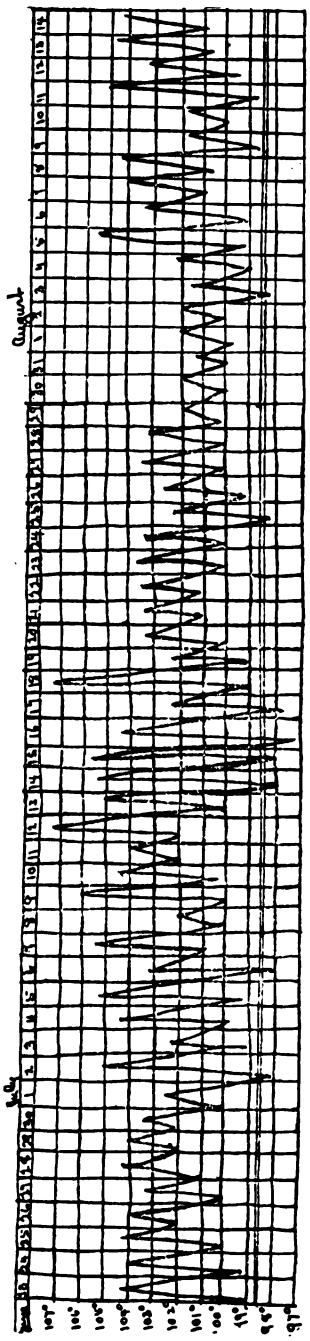
In 1905, Captain C. F. Craig[1] reported a case of malta fever originating in Washington, D. C., in the person of a nurse who was supposed to have contracted the disease while nursing infected soldiers recently returned from the Philippine Islands. At the same time he reported nine cases among soldiers, who had contracted the disease in the latter islands, and suggested that a careful study of obscure cases of continued fevers, with especial reference to the agglutination of a culture of *Microbacillus melitensis,* would proably show that the disease is far more frequent on this continent than is generally supposed. Since then numerous cases have been reported in Texas by Lieutenants Ferenbough and Gentry[2], and more recently several cases have been reported in Arizona by Yount and Looney.[3]

Thinking that possibly the disease exists in Louisiana also, we decided to make agglutination tests with a culture of *Microbacillus melitensis* on every case of continued fever observed by us, in which a negative Widal reaction was obtained. In all, forty-six separate observations were recorded, with only one positive case, which is of sufficient interest from a clinical standpoint to warrant reporting in detail.

This case, while observed in Louisiana, evidently became infected in Jackson County, Texas, the source of infection remaining undemonstrable, as he had never knowingly partaken of goat's milk, nor had he been in contact with anyone ill with fever or "rheumatism."

*Received for publication October 29, 1913.

Digitized by Google



Case Report.

Mr. L. R., white farmer, 50 years of age, a native of Mexico, but a resident of Jackson County, Texas, for fifteen years, was admitted to the Presbyterian Hospital June 23, 1913.

Family History—Father and mother died on the same day, apparently of yellow fever. He was an only child and there is no history of tuberculosis or lues in his antecedents. He is the father of one healthy daughter.

Previous History—He had smallpox at the age of ten years, malaria fever in 1904, and contracted amoebic dysentery in 1909, from which he suffered for two years until cured by one of us[4] with salol-coated ipecac pills in December, 1911. He returned to Jackson County, Texas, and engaged in farming until March, 1913, when he was compelled to cease on account of present illness. He has never had any venereal disease and is a very moderate drinker. He has never had any goats on his farm, has never partaken of goat's milk and has not been in contact with anyone having fever or "rheumatism" for at least two years.

Present Illness—In the early part of March, 1913, while residing in Jackson County, Texas, he began to have vague body pains and irregular fever, with an occasional chill and sweats. He was treated for "malaria" and took large doses of quinine, but with no effect upon the condition, the fever persisting, with more frequent chills and profuse sweats.

Digitized by Google

He came to New Orleans and was admitted to the Presbyterian Hospital, June 23, 1913.

Physical Examination.—There has not been much emaciation and patient is thirty pounds heavier than when last seen in 1911. He was able to walk to hospital, and shows very little effect of fever. There is no arthritis and tongue is clean. Heart and lungs are normal, systolic blood pressure 150. Temperature 99.4, pulse 100, and respiration 24. Liver dullness in mammary line is 10 cm. There is no tenderness over organ or in region of gall bladder. Spleen palpable and firm to the touch. There is considerable tympanites, but no areas of localized sensitiveness in the abdominal cavity. The superficial lymphatics are not palpably enlarged.

Blood Picture.—Hemoglobin 80%, red blood cells 3,800,000, leucocytes 17,250. Differential count: neutrophiles 87%, small mononuclears 9%, large mononucleors 4%, eosinophiles 0, basophiles 0. Widal reaction negative. No plasmodia.

Urine.—Specific gravity 1,010, acid, no abnormalities whatever, except slight trace of indican.

Examinations of stools and of secretions on rectal tube, negative for amoeba.

He remained under close observation until August 14, during which time his fever rose at times as high as 107, but at no time was there very much constitutional disturbance, until the last week, when he edveloped a broncho pneumonia, from which he died.

It is of interest to note that the leucocyte count remained high, 36,000, throughout the course of the disease, and the percentage of neutrophiles was always over 85%, and in one count was 94%. Anemia was progressive, hemoglobin falling to 55%, and total red cells to 2,600,000. Repeated aspirations of the liver were made, but no pus was at any time found, and it was only after obtaining a positive agglutination with a culture of *microbacillus melitensis* 1-40 in 30 minutes and 1-80 in one hour that a positive diagnosis of malta fever was made. The culture used was strain "G," obtained from Dr. P. W. Bassett-Smith. We had earlier obtained only partial agglutination with cultures on hand. Blood cultures were negative for all organisms

Digitized by Google

except *Microbacillus melitensis,* which was obtained July 10, in pure culture from the blood withdrawn under aseptic conditions from the median basilic vein.

One other point of interest in the case, which is typical of the disease, was the development of an acute arthritis of the left elbow joint on July 28, which slowly subsided under warm applications and rest. Previous to death he developed a myocarditis with a soft systolic murmur at the apex.

He died on August 14 and a partial autopsy was held, the spleen being removed at autopsy. The liver was firm and no evidences of any abscess formation could be noted, the hand being passed well up behind the organ and under the diaphragm. The spleen was wrapped in sterile gauze and placed on ice, when cultures were made from its interior six hours later. The cut surface of the spleen showed very little proliferation of spleen pulp, while the organ was firm and normal in color.

The chart showing the temperature curve of this case, when studied in conjunction with the clinical findings, represents as typical a case of malta fever as can be found. The fact that it was observed in New Orleans and is, as far as we have been able to ascertain, the first case reported in Louisiana, is sufficient excuse for our publishing same. We have not attempted to deal either with the bibliography or with the symptoms of the disease, but wish simply to call attention to the presence of the disease in this locality, with the hope that others will be reminded of the possibility of malta fever in arriving at a proper diagnosis in many continued fevers which come under their observation.

Bibliography.

1. C. F. Craig, International Clinics, 1905-89.

2. Ferenbough and Gentry, J. A. M. A., August 26, 1911, p. 730. September 9, 1911, p. 889, and September 23, 1911, p. 1045.

3. Young and Looney. Arizona Medical Journal, April, 1913, p. 18.

4. Eustis. Personal communication. Note—Repeated examinations after passage of rectal tube and after proctoscopic examinations failed to reveal any amoebae. During the year and a half intervening between the ipecac treatment and the onset of Malta fever there was no dysentery and bowels were constantly constipated.

Digitized by Google

A CASE OF DHOBIE ITCH (TINEA CRURIS), WITH NOTES ON THE CULTIVATION OF THE CAUSAL FUNGUS (EPIDERMOPHYTON RUBRUM).*

WM. LOUIS CULPEPPER, B. Sc.,
New Orleans.
(From the School of Hygiene, Tropical Medicine and Preventive Medicine, Tulane University.)

History of Patient.

Name, Major S. Mother and father dead. Died of old age. Has no sisters. Two living brothers, in good health. Carcinoma and tuberculosis negative. Venereal history negative. Present occupation, government accountant. Occupation when disease was first noticed, Major in the U. S. Army. Patient sailed from San Francisco, November 1, 1898, and reached Manila December 8, remaining there one week, but not going ashore. From here he sailed to Cavite, where he landed and went into camp at the edge of town, and remained there until April 1, 1899. He said that while here he noticed the eruption two days after he had his first bath and changed underclothes, which he says he washed out himself in stagnant lagoon water and allowed to dry on the moss. He says that he thinks the fungus must have gotten on his clothes while they were drying. The lesion started as a small, irregular, abrupt, red splotch on the inner side of the right thigh, in the crural region. The lesion looked angry and somewhat elevated, especially around the edges. The lesion then began to spread, and in ten days the right inner surface of the thigh presented the same picture as that of the left. Within three weeks there were patches as large as the palm of the hand on either side, which remained there, neither growing better nor worse until the patient went back to San Francisco, which was on October 1, 1899. When he reached San Francisco the eruption entirely disappeared within two weeks. He left there for Iowa one month later, where he remained for five years.

*Received for publication November 1, 1913.

Digitized by Google

The lesions returned in the summer months, to disappear again in the winter. This continued throughout the five years spent in Iowa. From Iowa the patient went to Panama, where he remained five years. During this time he claims the eruption never left, giving him much trouble, pain, burning and itching. At times when the weather was very hot he said that the pains were almost unbearable. During this five years different areas that were affected would flare up at different times, but not in new places, the skin being attacked only in the sight of old lesions. The patient then came to New Orleans three years ago, September 7, 1910, still complaining of the eruption, which had now begun to spread, attacking the axillary regions first, then the back of his neck, where the collar rubs. The trunk of his body showed no lesions whatever. All this took place within eight weeks after his arrival. He claims during the summer months that he suffers considerably, the lesions becoming worse, but in the winter very little discomfort is offered, although the lesions remain throughout the year. I saw the patient October 9, 1913, and he showed the following:

Clinical Lesions.

The lesions were distributed over the scroto-crural, inguinal, axillary and neck regions, presenting the following appearance: They were slightly raised, especially around the irregular, abrupt edge, which was markedly red and injected. They were not symmetrical and seemed to be composed of, on close examination, close-set papules which were very numerous and covered in places with minute bloody crusts, due to scratching. The lesions around the genitals and on the buttocks were complete, solid, festooned patches, extending on either side about six inches down on the inner part of the thigh. Those in the axillary regions showed the same characteristics. Those on the neck were gyrations inclosing normal skin in places; some, however, were round in shape and resembled the lesion of *Tinea circinata,* being about the size of a ten-cent piece. In places where the lesions were disappearing the skin showed a light brown pigmentation, covered with numerous minute round scales, so united as to cover the area of the original lesion. These scales presented a pecu-

Digitized by Google

liar ring form appearance. The margins of the lesions (no matter what shape they took) are of a bright red color and slightly raised. On scratching away some of the scales of the milder lesions the skin looked apparently healthy, except for the slight brownish pigmentation. In some of the most active lesions a few small papules containing staphylococcus were noticed; this was due to a secondary infection brought about by scratching.

Laboratory Findings.

Eighteen attempts were made to get a culture from the patient before a final successful one. Each times scales were taken from the lesions (both active and dormant) and planted on Sabouraud's maltose agar, which is composed of maltose, 4 grams; peptone, 1 gram; agar, 1.5 grams; distilled water, 100 c. c., and allowed to incubate at a temperature of 37° C. for 148 hours. Then sub-cultures were planted on Sabouraud's second medium, for preventing pleomorphism, composed of agar, 1.8 grams; peptone, 5 grams; distilled water, 100 c. c. Cultures were also planted on glycerine agar, which is composed of the following: agar, 1.5 grams; peptone, 1 gram; sodium chloride, 0.5 grams; glycerine, 6 c. c.; distilled water, 100 c. c. In the meanwhile specimens of the growths were taken daily and stained with Gram's stain, carbol-fuchsin, and Loeffler's methylene blue stains, and careful drawings were made from the microscope.

The fungus planted on Sabouraud's agar showed the following, as recorded daily. Tubes were inoculated October 21.

On October 22, no growth was apparent.

On October 23, no growth was apparent.

On October 24, a slight swelling of the scale used for inoculation was perceptible, with a slight change of color of the original scale (white) to a very light yellow, presenting a round shape and measuring about one-sixteenth of an inch in diameter.

On October 25, the tubes showed the same characteristics as that of the 24th, only much more marked.

On October 26, a brownish-yellow color was assumed by the growth, and a uniform spreading in all directions was distinctly noticeable. The center of the growth began to take on a knob-shaped appearance, with a light, pinkish-red tinge. The growth

Digitized by Google

measured one-fourth of an inch in diameter, maintaining its original shape. With a pocket lense distinct branching of delicate, minute character was seen in the growth, which appeared as small submerged radiations from the center, particularly around the knob.

On October 27 the growth made great strides in this twenty-four hours, the center had taken a dark reddish-pink color, with a knoblike appearance much more pronounced; in fact, visible with the naked eye. The entire growth, especially in the center, looked rough and raised, being somewhat dull. Light pinkish-red radiations from the knob and edges of the growth had become colored reddish-yellow and were visible only with the aid of a pocket lense. These radiations were of a delicate, translucent pinkish-yellow color, rather they looked so, because of the discoloration of the medium in that particular portion. The fungus now had attained the size of a dime. A very small, delicate, grayish-white duvet had begun to cover the growth, seemingly having started around the knob, reaching just a short distance from it.

On October 28, the growth had not grown in size during this twenty-four hours, but seemed to have taken a submerged course, so much so that fully one-third of it looked as thought it had been planted that far down into the medium. It had assumed a much darker red color, with discoloration of the surrounding medium. The center or knoblike appearance taking a reddish-black color, the small radiations being indeed more numerous and abundant. The duvet had taken a greenish-yellow color, almost entirely hiding the red color of the growth.

The data obtained from the culture which was planted for microscopical study on the medium used to prevent pleomorphism are as follows:

The fungus was planted on this agar October 26.

On October 27 there was no apparent growth.

On October 28 there was no apparent growth.

On October 29 a small pinpoint elevation was noticed, only with the aid of a pocket lense. It presented a dull, grayish-white appearance.

On October 30 a growth about the size of a small bead was

Digitized by Google

noticed. It showed a brownish-yellow color, looking somewhat dull and rough. Small, delicate, translucent, hyaline-like radiations were beginning to form.

On October 31 the growth had reached the size of a dime, the knoblike appearance in the center showing the same characteristics as that of the previous day, only to a much more marked degree. There was absolutely no discoloration of the medium present. Very distinct radiations were visible with the naked eye and the early formation of a greenish-white duvet was quite pronounced. The growth seemed to have taken a submerged course in the medium.

On November 1 no apparent change from that of October 31, except more distinct features and a more extensive growth of the duvet, which had begun to take on a greenish-yellow appearance.

Practically the same results were obtained on glycerine agar as those found and mentioned on Sabouraud's maltose agar, with the exception that the fungus seemed to have thrived better on this medium, which resulted in a more luxuriant growth and clearer defined characteristics.

The morphology of fresh and stained specimens of the fungus correspond accurately with the descriptions of *Epidermophyton cruris* Castellani, 1905. Further laboratory observations on our cultures of this fungus are in progress.

The author wishes to acknowledge his indebtedness to Professor Creighton Wellman for advice and criticism during the progress of this study.

Digitized by Google

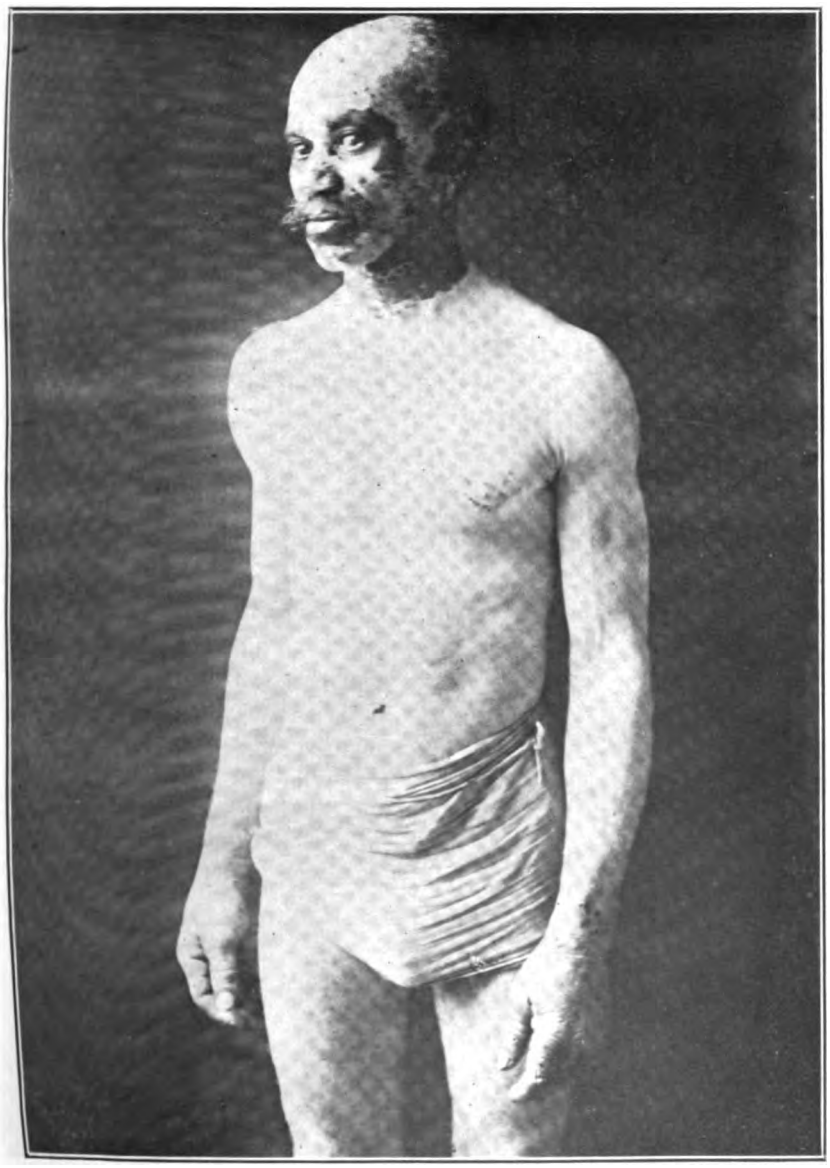
A NOTE ON PINTA.*

J. E. SMITH, M. D.,
Panama.
(From the United Fruit Company's Hospital, Bocas del Toro, Panama.)

The patient here presented has lived in the West Indies, Central America, since birth. The leucoderma, or, more properly speaking, the vitiligo, as the condition is not congenital in this instance, has been in progress for many years, having begun on the hands and feet, or rather the wrists and ankles. The patient has always enjoyed excellent health and, as the accompanying photograph shows, is well nourished and in good muscular condition. While this disease is called "Pinta" by the natives, it is very different from the true pinta of Gastambide, Montoya and other systematic writers, who describe a disease due to various kinds of fungi, including several species and genera. In such cases as the present there is no pruritis, inflammation or desquamation, the condition resembling the classical vitiligo supposed to be due to trophoneurosis, and the skin of the writer's patient, except for the loss of color, is apparently normal. In some regions of Central America this affection is very common, certain localities boasting almost a hundred per cent. of affected population.

*Received for publication October 11, 1913.

Digitized by Google



SMITH PINTA (VITILIGO)

Digitized by Google

Digitized by Google

NOTE ON THE MOUNTING OF MOSQUITO LARVAE.*

W. V. KING, B. Sc.,
New Orleans.
(From the School of Hygiene, Tropical Medicine and Preventive Medicine, Tulane University.)

For a rapid method of making permanent slide mounts of whole mosquito larvae for examination under a microscope I have found the following process to be very satisfactory.

For killing, hardening and clearing the specimens a solution of equal parts of pure carbolic acid crystals and absolute alcohol is used. The live larvae are placed in a small dish or on a slide, the excess of water removed with blotting paper, and a few drops of the carbol-alcohol solution poured on them. After 15 to 30 minutes in this solution the larvae are in condition for mounting in a medium of turpentine colophonium. If the larvae have been treated in a dish they are removed to the slide with a pipette which has a fair-sized opening, or if they have been treated on the slide, as much of the carbol-alcohol as possible is removed and they are then mounted under a cover slip.

The colophonium medium is much better for this than xylol balsam and may be prepared by dissolving small lumps of pale colophonium in rectified oil of turpentine.

By this method the handling of the specimens is reduced to a minimum, the chitinous parts are cleared sufficiently for examination, and little or no shrinkage takes place in the soft parts of the body or even in such delicate structures as the anal gills.

The moulted larval and pupal skins may be quickly prepared for balsam or colophonium mounts by dehydration for a few minutes in the carbol-alcohol. The colophonium mounts should be examined occasionally for several weeks to remedy any shrinkage of the medium.

This method should be adaptable to the preparation of other soft-bodied arthropods of which the chitinous parts are to be studied.

*Received for publication November 1, 1913.

Digitized by Google

THE AMERICAN SOCIETY OF TROPICAL MEDICINE

A prominent member of the Society has suggested that the JOURNAL publish a complete list of members. Such an official list has been kindly furnished by the Secretary, Dr. John M. Swan, and is herewith printed.—Editor.

MEMBERS.

ACTIVE

1904. Dr. Roger Post Ames, Puerto Barrios, Guatemala.
1910. Dr. J. W. Amesse, 520 Metropolitan Bldg., Denver, Colo.
C. Dr. James M. Anders, 1605 Walnut St., Philadelphia, Pa.
1908. Dr. Bailey K. Ashford, 2 San Cristobal, San Juan, Puerto Rico.
1909. Dr. J. Edward Augustin, Puerto Cortez, Honduras.
1908. Dr. Lewellys F. Barker, 1035 N. Calvert St., Baltimore, Md.
1908. Dr. C. C. Bass, 741 Carondelet St., New Orleans, La.
1909. Dr. J. F. Bates, Ancon, Canal Zone.
1910. Dr. Khleber H. Beall, Fort Worth, Texas.
1908. Dr. George S. Bel, Medical Bldg., New Orleans, La.
1912. Dr. William H. Bell, U. S. Navy Department, Washington, D. C.
1908. Dr. Rupert Blue, U. S. Public Health Service, Washington, D.C.
1908. Dr. Thomas R. Boggs, 21 W. Chase St., Baltimore, Md.
1905. Dr. Sherman G. Bonney, Stedman Bldg., Denver, Colo.
1910. Dr. Fred B. Bowman, Bureau of Science, Manila, P. I.
1909. Dr. John C. Boyd, 1621 22nd N. W. Washington, D. C.
1910. Dr. Walter Brem, 423 Security Bldg., Los Angeles, Cal.
1905. Dr. Issac W. Brewer, Taughannock Falls, N. Y.
1910. Dr. William M. Brumby, San Antonio, Texas.
1908. Dr. Charles S. Butler, U. S. Naval Medical Supply Depot, Canacao, P. I.
1909. Dr. W. P. Chamberlain, Plattsburg Barracks, Plattsburg, N. Y.
1908. Dr. Rufus Cole, Rockefeller Hospital, 66th and Ave. A., New York City.
C. Dr. W. M. L. Coplin, 606 S. 48th St., Philadelphia, Pa.
1908. Dr. Chas. F. Craig, U. S. Army Medical Museum, Washington, D. C.
1913. Dr. Richard H. Creel, U. S. Public Health Service, Washington, D. C.
C. Dr. J. Chalmers Da Costa, 1831 Chestnut St., Philadelphia, Pa.
C. Dr. Judson Daland, 317 South 18th St., Philadelphia, Pa.
1910. Dr. S. T. Darling, Ancon, Canal Zone.
1907. Dr. Thomas Darlington, 48 W. 59th St., New York City.
1907. Dr. William H. Deaderick, Helena, Ark.
C. Dr. Samuel G. Dixon, Ardmore, Pa.
1905. Dr. George Dock, 1806 Locust St., St. Louis, Mo.
1906. Dr. E. K. Dunham, University and Bellevue Hospital Medical College, New York City.
1909. Dr. Charles W. Duval, Medical Department, Tulane University, New Orleans, La.
1909. Dr. Isadore Dyer, 124 Baronne St., New Orleans, La.

Digitized by Google

1908. Dr. John B. Elliott, Jr., Morris Building, New Orleans, La.
1908. Dr. C. P. Emerson, Med. School, Univ. of Indiana, Indianapolis, Ind.
——. Dr. R. H. von Ezdorf, U. S. Marine Hospital, Mobile, Ala.
C. Dr. Thos. H. Fenton, 1319 Spruce St., Philadelphia, Pa.
1908. Dr. C. L. Furbush, 1501 Spruce St., Philadelphia, Pa.
1905. Dr. T. B. Futcher, 3 W. Franklin St., Baltimore, Md.
1910. Dr. Phillip E. Garrison, New York Post-Graduate Medical School, New York City.
1908. Dr. W. C. Gorgas, Ancon, Canal Zone.
1905. Dr. Ramon Guiteras, 80 Madison Ave., New York City.
1913. Dr. Fraser B. Gurd, 406 Mackay St., Montreal, Canada.
1909. Dr. J. Birney Guthrie, 305 Baronne Street, New Orleans, La.
1910. Dr. P. Gutierrez Igaravidez, San Juan, Puerto Rico.
1912. Dr. John T. Halsey, 724 Baronne Street, New Orleans, La.
1905. Dr. H. F. Harris, Atlanta, Ga.
1908. Dr. Seale Harris, 57 St. Joseph St., Mobile, Ala.
1907. Dr. J. Leffingwell Hatch, 30 W. 51st St., New York City.
1912. Dr. Victor G. Heiser, Manila, P. I.
1912. Dr. Graham E. Henson, St. James Bldg., Jacksonville, Fla.
1907. Dr. Maximilian Herzog, The Mallers Bldg., Chicago, Ill.
1912. Dr. A. Parker Hitchens, Glenolden, Pa.
1913. Dr. Henry S. Houghton, Harvard Med. School of China, 7 Siccawei Road, Shanghai, China.
1909. Dr. Edward H. Hume, 3 Whitehall, New Haven, Conn.
C. Dr. Abraham Jacobi, 19 E. 47th St., New York, N. Y.
1908. Dr. William H. Jefferys, University Club, Philadelphia, Pa.
C. Dr. W. W. Keen, 1729 Chestnut St., Philadelphia, Pa.
1910. Dr. William Murray Kerr, Navy Department, Washington, D. C.
1912. Dr. William Krauss, Memphis Trust Bldg., Memphis, Tenn.
C. Dr. D. Braden Kyle, 1517 Walnut St., Philadelphia, Pa.
1905. Dr. Alexander Lambert, 36 East 31st St., New York City.
1909. Dr. C. H. Lavinder, U. S. P. H. Service, Savannah, Ga.
1905. Dr. Egbert LeFevre, 52 W. 56th St., New York City.
1910. Dr. Isaac Ivan Lemann, Perrin Building, New Orleans, La.
1906. Dr. Edward M. L'Engle, Bisbee Bldg., Jacksonville, Fla.
1909. Dr. James F. Leys, Colon Hospital, Colon, Canal Zone.
1908. Dr. O. T. Logan, Changteh, Hunan, China.
1911. Dr. John D. Long, 3 B St., S. E., Washington, D. C.
1909. Dr. Clara S. Ludlow, U. S. Army Medical Museum, Washington, D. C.
1909. Dr. Walter McCaw, Surgeon General's Office, Washington, D. C.
C. Dr. Guthrie McConnell, Temple Medical College, 18th and Buttonwood Sts., Philadelphia, Pa.
1910. Dr. John B. McElroy, Memphis, Tenn.
C. Dr. Joseph McFarland, 442 W. Stafford St., Germantown, Philadelphia, Pa.
1912. Dr. James S. McLester, Birmingham, Ala.
1905. Dr. Rudolph Matas, 2255 St. Charles Ave., New Orleans, La.
1908. Dr. H. W. Miller, Washington, D. C.
1908. Dr. A. J. Mink, 1810 I Street, N. W., Washington, D. C.

Digitized by Google

C. Dr. J. K. Mitchell, 1730 Spruce St., Philadelphia, Pa.
1908. Dr. John T. Moore, 506 Scanlan Bldg., Houston, Texas.
1909. Dr. Roger S. Morris, Clifton Springs, N. Y.
1908. Dr. W. E. Musgrave, 194 Herran, Manila, P. I.
1910. Dr. Henry J. Nichols, War Department, Washington D. C.
1908. Dr. Paul Osterhout, Bocos Del Toro, Panama.
1906. Dr. Henry DuR. Phelan, Fort Baker, Sausalito, Cal.
C. Dr. B. A. Randall, 1717 Locust St., Philadelphia, Pa.
C. Dr. S. D. Risley, 1824 Chestnut St., Philadelphia, Pa.
1913. Dr. Damaso Rivas, University of Pennsylvania, Philadelphia, Pa.
1911. Dr. Milton J. Rosenau, Harvard Medical School, Boston, Mass.
1906. Dr. B. Franklin Royer, Donaldson Apartments, Second and Locust Sts., Harrisburg, Pa.
1905. Dr. Louis Seaman, 247 Fifth Ave., New York City.
1908. Dr. Edwin C. Shattuck, 616 N. 52nd St., Philadelphia, Pa.
1909. Dr. George C. Shattuck, 227 Beacon St., Boston, Mass.
1909. Dr. Joseph F. Siler, New York Post-Graduate Medical School, New York Ciy.
1911. Dr. Sidney K. Simon, 1209 Maison Blanche Bldg., New Orleans, La.
1909. Dr. Henry Skinner, Ardmore, Pa.
C. Dr. Allen J. Smith, University of Pennsylvania, Philadelphia, Pa.
1908. Dr. William F. Snow, Stanford University, Cal.
1907. Dr. Edward R. Stitt, Navy Department, Washington, D. C.
1908. Dr. Richard P. Strong, Hotel Victoria, Boston, Mass.
C. Dr. John M. Swan, 457 Park Ave., Rochester, N. Y.
1910. Dr. Paul T. Talbot, 709 Maison Blanche Bldg., New Orleans, La.
1909. Dr. Elmer S. Tenney, in care of Chief Surgeon, Division of the Philippines, Manila, P. I.
1905. Dr. W. S. Thayer, 406 Cathedral St., Baltimore, Md.
1908. Dr. Chilton Thorington, 6½ Dexter Ave., Montgomery, Ala.
1910. Dr. John L. Todd, McGill University, Montreal, Canada.
1910. Dr. Roy M. Van Wart, 1126 Maison Blanche Bldg., New Orleans, La.
1908. Dr. Joseph D. Weis, 108 Baronne Street, New Orleans, La.
1910. Dr. Creighton Wellman, School of Tropical Medicine, Tulane University, New Orleans, La.
1905. Dr. C. Y. White, 1808 Diamond St., Philadelphia, Pa.
1908. Dr. J. H. White, U. S. Public Health Service, New Orleans, La.
C. Dr. James C. Wilson, 1509 Walnut St., Philadelphia, Pa.
1910. Dr. Edward J. Wood, Wilmington, N. C.
C. Dr. Barton L. Wright, U. S. Naval Hospital, Pensacola, Fla.
1912. Dr. A.H. Zeiler, 423 Security Bldg., Los Angeles, Cal.

Digitized by Google

HONORARY.

1903. Prof. Aristides Agramonte, University of Havana, Havana, Cuba.
1908. Prof. Raphael Blanchard, 226 Blvd. St. Germain, Paris, France.
1903. Dr. A. Calmette, Institute Pasteur, Lille, France.
1907. Dr. Choksy, Arthur Road and Maratha Hospital, Bombay, India.
1904. Dr. L. E. Cofer, U. S. P. H. Service, Seattle, Wash.
1904. Dr. Carlos Finlay, Havana, Cuba.
1904. Dr. Simon Flexner, Rockefeller Institute, New York City.
1903. Dr. W. H. Forwood, 1425 Euclid Ave., Washington, D. C.
1904. Prof. B. Grassi, Rome, Italy.
1905. Prof. John Guiteras, University of Havana, Havana, Cuba.
1905. L. O. Howard, Ph. D., U. S. Dept. of Agriculture, Washington, D.C.
1904. Dr. W. W. King, Jr., U. S. P. H. Service, Washington, D. C.
1904. Prof. Kitasato, Tokio, Japan.
1904. Dr. W. Kolle, Koch's Institute for Infectious Diseases, Berlin, Ger.
1903. Prof. A. Laveran, Institute Pasteur, Paris, France.
1904. Dr. Edouardo Liceaga, Mexico City, Mexico.
1903. Sir Patrick Manson, 21 Queen Anne St., Cavendish Sq. W., London, Eng.
1903. Dr. Chas. J. Martin, Lister Institute of Preventive Medicine, Chelsea Gardens, London, Eng.
1904. Prof. Eli Metchnikoff, Pasteur Institute, Paris, France.
1903. Dr. F. Montizambert, Office of the Director General of Public Health, Ottawa, Canada.
1903. Dr. William Murrell, 17 Welbeck St., Cavendish Sq. W., London, Eng.
1903. Prof. George H. F. Nuttall, Cambridge, Eng.
1903. Dr. Ogata, University of Tokio, Tokio, Japan.
1905. Sir William Osler, Oxford, Eng.
1904. Prof. Paltauf, University of Vienna, Vienna, Austria.
1904. Prof. Roux, Pasteur Institute, Paris, France.
1903. Dr. D. E. Salmon, University of Montevideo, Uruguay.
1904. Dr. Sanarelli, Rio de Janeiro, Brazil.
1907. Dr. F. M. Sandwith, 31 Cavendish Sq., London, W., Eng.
1903. Dr. George M. Sternberg, 2005 Massachusetts Ave., N. W., Washington, D. C.
1903. Dr. Chas. Wardell Stiles, U. S. Public Health Service, Washington, D. C.
1903. Prof. Ralph Stockman, Glasgow, Scotland.
1903. The Surgeon General, U. S. Army, Washington, D. C.
1903. The Surgeon General, U. S. Navy, Washington, D. C.
1904. Dr. E. E. Trotter, U. S. P. H. Service, Washington, D. C.
1906. Prof. Henry B. Ward, University of Illinois, Urbana, Ill.
1903. Prof. Wm. H. Welch, Johns Hopkins Univ., Baltimore, Md.

Digitized by Google

CORRESPONDING.

1909. Dr. Andrew Balfour, Woodcote Churt, Surrey, Eng.

1910. Col. W. B. Bannerman, I. M. S., Plague Research Laboratory, Parel, Bombay, India.

1907. Col. W. B. Browning, I. M. S., care of Messrs. H. S. King & Co., 9 Pall Mall, London, W., Eng.

1904. Prof. A. Castellani, Colombo, Ceylon.

1907. Sir R. Havelock Charles, India Office, Whitehall, S. W., London, Eng.

1907. Dr. C. W. Daniels, 21 Queen Anne Street, Cavendish Sq., London, W., England.

1904. Dr. E. S. Goodhue, The Doctorage, Holualoa, Kona, Hawaii.

1904. Dr. W. J. Goodhue, Kalaupapa, Molokai, H. I.

1907. Capt. W. Glen Liston, Plague Research Laboratory, Bombay, India.

1907. Col. C. P. Lucks, I. M. S., Calcutta Medical School, Calcutta, India.

1907. Dr. J. Percival Mackie, Bombay, India.

1904. Dr. Jesus E. Monjaras, Mexico City, Mexico.

1904. Dr. W. E. Park, Soo Chow, China.

1907. Sir Allain Perry, Colombo, Medical College, Colombo, Ceylon.

1907. Major Leonard Rogers, 8 London St., Calcutta, India.

1904. Sir Ronald G. Ross, Liverpool School of Tropical Medicine, Liverpool, Eng.

1907. Dr. A. T. Stanton, Institute for Medical Research, Kuala Lumpur, Federated Malay States.

1906. Dr. John M. Swan, Canton, China.

Digitized by Google

NEWS AND COMMENT

The City of Albuquerque, New Mexico, has established a board of health.

An Australasian medical congress has been arranged, to be held in Auckland, New Zealand, next February.

Dr. E. S. McCain, of the State Board of Health of Texas, has assumed charge of the refugee camps at Tampico, Mexico.

Plague has broken out in Novo-Tcherkask, Russia. Eleven cases are reported in the city, which is under military quarantine.

Since the Balkan war, 167 cases of cholera have been reported in Hungary and 49 in Austria. Two of the cases occurred in Vienna.

Professor Loeffler of Greifswald has been elected Director of the Institut für Infektions-Krankheiten, to succeed Professor Gaffky.

Arkansas has established a state hygienic laboratory and is contemplating the equipping of a state health car for the instruction of the public in preventive medicine.

The Iowa State Medical Society has inaugurated a campaign for public health throughout the state. The Council on Public Health of the American Medical Association will coöperate in the work.

Mr. George W. Watts, of Durahm, North Carolina, will build an addition to the Watts Hospital of Durham, the new building to be devoted exclusively to the study and treatment of pellagra.

Digitized by Google

Drs. Henry R. Carter and John C. Rodman have completed a series of public meetings held for the purpose of educating the medical profession and the public in the problems of malaria throughout North Carolina.

During the first week of September 401 new cases of cholera with 165 deaths were reported in Roumania. This makes a total of 1,452 cases and 623 deaths. A number of cases were also reported from Silistria.

As a result of the floods in Dayton, Ohio, the sanitary organization of the city has been revised, a Bureau of Municipal Research established, and adequate appropriations made for future work in sanitation and disease prevention.

At the last meeting of the American Public Health Association, Dr. W. C. Woodward was elected president; Drs. John F. Anderson, Mario Labredo and C. J. Hastings, vice presidents; Dr. S. M. Gunn, secretary, and Dr. Livingston Ferrand, treasurer.

Rat plague has appeared at Seattle, Washington. During the first three weeks of October seven plague-infected rats were found along the water front. The United States Health Service and the municipal board of health are in active coöperation in the control of the epidemic.

Several changes have recently been made by the War Department at the Army Medical School. Col. Walter D. McCaw and Major Charles R. Reynolds are no longer on duty at the school, and Lieut.-Col. C. C. McCullough, Jr., has been designated as Professor of Tropical Medicine. Lieut.-Col. J. D. Glennan and Major E. R. Whitmore have been assigned to duty as Professors of Medical Department Administration, and of Bacteriology, respectively, and Capt. M. Talbott is to be Assistant Professor of Ophthalmology.

Digitized by Google

CURRENT LITERATURE

A New Species of Philaematomyia, with Remarks on the Genus. (Ibid., p. 26 ff.) Patton and Cragg describe a new species of this genus (*P. gurnei*) and add careful redescription of the other Indian species. This article is accompanied by Mrs. Patton's beautiful plates.

Creighton Wellman.

Low Porteid Diet.—(Journal de Medicine, No. 23, 1913.) M. A. Gottschalk recommends a low proteid diet, as recommended originally by Chittenden, but considers that it is not necessary to become a strict vegetarian if there is a reduction in the amount of animal food ingested.

Allan Eustis.

Haemophagous Species of the Genus Musca, with Descriptions of Two New Species.—(Indian Journal of Medical Research, v. i, No. 1, July, 1913, p. 11 ff.) W. S. Patton and F. W. Cragg, in a most careful paper, study the four biting species of this genus, including two that are new to science (*M. gibsoni* and *M. bezii*). The descriptions include the life histories. The article is also illustrated by a series of beautiful plates drawn by Mrs. Patton. Creighton Wellman.

The Meteorology of Malaria.—(Jour. Trop. Med., 1913, xvi, 25.) Matthew D. O'Connell believes that by regarding malaria as dependent upon atmospheric conditions we avoid the necessity of presuming the existence of a toxin to explain the intermittent pyrexia, hemolysis and splenic enlargement. He seems to disregard the existence of the parasite and the likelihood that its disintegration produces a toxic substance even if in the nature merely of a foreign proteid.

John M. Swan.

A Case of Acute Agchylostomiasis Treated by an Autogenous Vaccine of a Coliform Organism.—(Jour. Trop. Med., 1913, xvi, 260.) R. G. Archibald concludes from a study of the case reported that in certain severe and intractable cases of agchylostomiasis, the symptoms present may be dependent on the absorption of certain intestinal organisms and their toxins. In such cases beneficial results may be obtained by the use of autogenous vaccines. In this case the vaccine was made from a bacterium of the colon group obtained from the feces.

J. M. S.

Experimental Infection of Mule with Trypanosoma hippicum by Means of Musca domestica.—(Jour. of Experimental Med., xv, 1912, pp.

Digitized by Google

365-366.) S. T. Darling (Panama) having observed cases of "murrina" in mules stabled with other animals infected with trypanosoma, thought that flies moving from exposed sores of an animal to the others may possibly have been the carriers. He demonstrated the transmission by experimenting with flies which fed on the blood of guinea pigs heavily infected, and brought on a mule's ear, scratched to the quick. One out of three mules became infected. E. M. Dupaquier.

Relapsing Fever: The Relation of Temperature to the Appearance and Disappearance of Spirochaetae in the Blood.—(The China Med. Jour., xxxii, No. 5, September, 1913, pp. 321-324.) O. T. Logan, in a brief article, discusses this neglected subject, giving details of the results of the examination of the blood of four patients. He found by careful examination and study of smears that the spirochaetae could be found in enormous numbers during the height of the temperature, but left the peripheral blood when the fever began to drop. In one case this occurred at least two and one-half hours before the fall. The author concludes that the organisms may be found if a careful search of a number of smears is made, and the crisis may be foretold to a fairly accurate degree by this systematic examination.

P. L. Querens.

Some Attempts to Transmit Trypanosoma gambiense by Wild Stomoxys; with a Note on the Intestinal Fauna of These Flies.—(Reports Sleep. Sickn. Comm. Roy. Soc., No. 13, 1913, pp. 89-93.) H. Lyndhurst Duke experimented with *Stomoxys nigra* and *Stomoxys calcitrans*. For several days he allowed them to feed on an infected monkey; then, immediately, or the following day, or after a day's interval, he let them fed on a sound monkey, until the death of the insects. No positive result was obtained. He never found any trypanosomes in the digestive tract of the *Stomoxys*. He observed only the presence of a *Bodo* and an elongated, crescentic, non-flagellated organism.

E. M. Dupaquier.

Emmerich's Hypothesis Regarding Cholera.—(Centralbl. f. Bakter., I., Origin., 1912, lxv, p. 26.) Joh. Biberfeld thinks Emmerich's views untenable, namely, that the cholera vibrio transforms the nitrates of food into toxic nitrous acid which causes the symptoms. Biberfeld shows that: 1. To bring about fatal intoxication, quite an amount of nitrous acid must be introduced into a dog's intestine, viz., 0.02 to 0.05 per kilogram of weight. 2. Then, in from 20 to 40 minutes, death comes with symptoms different from those of cholera, viz., intense methemoglobinhermia, with discoloration of the viscera and diphtheroid lesions of the intestinal mucous membrane. 3. A large quantity of Nordhafen vibrio (which produces more nitrites than the cholera vibrio) introduced with large doses of nitrates (7.5 in eight days) into a dog's intestine, causes no disorder whatsoever. E. M. D.

Digitized by Google

Diabetes.—(Zeitsch. f. Klin. Med. Heft 5 and 6, 1913.) H. Pribram and J. Lowry call attention to the results of their observations on cases of diabetes in which they obtained a marked increase in the lead precipitable nitrogen of the urine, pointing to a disturbance of nitrogen metabolism. They call attention to the importance of a consideration of the proteid metabolism in diabetes and recommend in severe cases with a tendency to acidemia a low proteid diet, even giving oatmeal, levulose and other articles rich in carbohydrates. In only the mild cases with a predominating disturbance of carbohydrate metabolism have they obtained the best results with a diet poor in carbohydrates. The preventive suggestions in this paper are interesting. Allan Eustis.

Transmission of Trypanosoma gambiense by Mosquitoes (Mansonia uniformis).—(Bull. Soc. Path. Exot., vi, June, 1913, p. 442.) F. Heckenroth and M. Blanchard confirmed the hypothesis of G. Martin, Leboeuf and Roubaud, that certain mosquitoes (*Stegomyia* and *Mansonia*) possibly transmitted *T. gambiense* to explain household epidemics in cabins and huts. But they had experimented only on the *T. brucei*. Heckenroth and Blanchard experimented on guinea pigs. In their first experiment a guinea pig infected with *T. gambiense* and another sound one were both enclosed in a screened cage, incompletely partitioned. The mosquitoes would freely move from the one to the other. In their second experiment the two guinea pigs were placed in the cage, each in turn, the infected one first, and then twenty-four hours later, the second one. Positive results were obtained. E. M. Dupaquier.

Relapsing Fever: Relation of Temperance to the Appearance and Disappearance of Spirochaetae in the Blood; Treatment by Salvarsan. (China Med. Jour., xxvii, No. 5, September, 1913, pp. 318-320.) H. B. Taylor reviews four cases (including himself) of relapsing fever and notes the nonappearance of the organisms in the peripheral blood until the third day of the fever with the temperature averaging 104°, but urges a more systematic and scientific study of the blood during the first three days. The author recommends the preparation of the smears of blood as follows: fix with equal parts of ether and alcohol ten minuts, then staining with dilute carbol-fuchsin (1-4 of water) without heat for 1-2 minutes. Salvarsan, according to the author, should be regarded as a specific, as he reports the cure of four cases (two with relapse), and includes the results of four cases of Dr. Cochram of Hwaiyuan which were cured by salvarsan, no relapses. The average dosage recommended is 2-3 decigrams intravenously, or 4 decigrams in oil intramuscularly, with the choice of the intravenous method.
P. L. Querens.

Agglutination Reaction in Dysentery. — (Centralbl. f. Bakt., I, Origin., lxvi, 1912, f. 5-6, pp. 426-441.) M. O. Romm and A. J. Balaschow

Digitized by Google

state that agglutination reaction is almost constant in dysentery. It was absent only in 7.6% of the cases observed. It is positive for the Shiga-Kruse bacillus in 1:50 dilution, and for the other varieties in 1:100. Agglutinins make their appearance in the blood from the fifth to the fourteenth day. In cases caused by bacilli of the Shiga-Kruse type, the serum of patients agglutinates not only the Shiga-Kruse bacillus, but also different other varieties of the same group, in the same degree and even more. When the cause is due to varieties affecting mannite, the serum of patients does not agglutinate the Shiga-Kruse, or if it does, it is little marked in a 1:25 dilution. Agglutination reaction allows differentiation of the Shiga-Kruse infection from that of the organisms which cause the fermentation of mannite; but it does allow to determine which of these is the infectious agent.

E. M. Dupaquier.

The Rat: A Sanitary Menace and an Economic Burden.—(Public Health Reports, v. xxviii, No. 27, July 27, 1913.) R. H. Creel, Passed Assistant Surgeon, calls attention to the vast sums spent in eradicating plague, and emphasizes the necessity of exterminating rats as a preventive measure. He considers that the economic burden of this pest is enormous. Figuring from results obtained by trapping in San Francisco, where the rodent population was estimated as slightly in excess of the human, and in rural districts that it is three or four times in excess, considers that an estimate of the rodent population of the United States as equal to the human census can safely be accepted as well within the actual figure. This estimate coincides with that made for Great Britain and Ireland by the Incorporated Society for the Destruction of Vermin, and also with authoritative figures for Denmark, France and Germany. He calculates that the annual upkeep per rodent is higher in the United States than in Great Britain, Denmark or France, and therefore considers that half a cent a day is a conservative estimate, quoting the same authorities as having computed the annual upkeep per rodent as $1.80, $1.20 and $1.00 respectively in the above-named countries. He thus arrives at the conclusion that the sum of $167,000,000 is annually lost to the country by the depredations of this pest, and offers this as an economic reason why rats should be exterminated. The author also gives some simple and effective directions for rat-proofing buildings.

Allan Eustis.

Studies on Goitre.—(Studien über den endemischen Kropf-Münchener Med. Wochenschr., August 19, 1913, No. 33, p. 1813.) Dieterle, Hirschfeld and Klinger, in order to study the question, established rat depots in various cities, in some of which goitre is endemic and others (Zurich) in which goitre is rare. They arrived at their conclusions only after observations on 5,600 rats distributde at Kaisten, Asp, Densburen, Schinznach Dorf, Ittenthal, Hornussen, Bozen, Effingen, Hunzenschwill,

Digitized by Google

Marthalen, Dattlikon, Rupperswill, Anenstein and Ellikon. The waters supplying these several stations were from different geological formations. They conclude that the water supply had no influence in the causation of the positive cases, for in Kaisten, in 693 rats, they obtained 61.6% positive cases, while in Densburen,which has the same geologically formed water, they obtained only 24% of positive cases in 304 rats. Further, rats kept in Zurich, which is goitre free, did not develop goitre when given the same water furnished to rats developing positive cases in endemic localities. They conclude, therefore, that water as an etiological factor in goitre is negligible and mention the possibility of infection by contact. Forty to seventy per cent. of the rats developed goitre, but the water supplied to them could not be regarded as a causative factor. The paper should be of interest to those who are studying goitre problems in the Tropics. A. E.

Attempts to Transmit Poliomyelitis by Means of the Stable Fly (Stomoxys calcitrans).—(Jour. A. M. A., lxi, pp. 461-466, August 16, 1913.) W. A. Sawyer and W. B. Herms, in seven well-controlled experiments, got only negative results in attempting to transmit poliomyelitis from monkey to monkey by means of the stable fly. The flies were bred from larvae and pupae and the adults, upon emergence, were placed in lots of 50 in glass jars, over the mouths of which pieces of bobbinet were fastened. The flies fed through this cloth. Experiments were made to determine these points in case the flies were capable of transferring the infection: the infective period in the inoculated monkey; the incubation period in the fly; the possibility of a mechanical transmission. One experiment duplicated those of Rosenau's and Anderson and Frost's in that the inoculated and normal monkeys were alternately placed in a cage containing a large number of stable flies. These experiments being negative, two others were tried in which the flies were made to feed through a layer of saliva, feces and nasal wastings from an infected monkey in one case, and through a layer of highly infectious brain tissue. This material was smeared on the skin of the monkeys. The length of life of the experimental flies averaged 20 days, with a maximum of 69 days in one specimen. From their studies of the life history of the stable fly the authors conclude that they cannot be controlled by the same means as are directed against the house fly, on account of different breeding habits. W. V. King.

The Etiology of Japanese River Fever.—(Mittheilunger der Medizinischen Fakultät der Kaiserhchen Japanischen Universität zu Tokio. Bd. X, Heft. 2, 1911. Centralblatt für Bakteriologie, Parasitenkunde, und Infektionskrankheiten, Bd. 62, 1912.) The articles of M. Ogata cover the work of a series of years (1909-11) in the Tsutsugamushi infected region along the banks of the Agano River and include investigations into the morphological features of a thread fungus, belonging

Digitized by Google

to the Askomyceses, which the author believes to be the causative agency of the disease. He also gives the results of treatment with mercury inunctions in patients and an account of the lesions in experiment animals, both with fresh cultures and direct inoculation of material from patients. The author concludes from his results that the Tsutsugamushi disease is an infectious disease produced by a characteristic thread fungus, transmitted by an animal parasite, and that this fungus, which he calls the Ssutsugamushi thread fungus or Tsutsugamushieumycetes, is closely related to the Askomycetes. Furthermore, this fungus is capable of producing the typical lesions of the Tsutsugamushi disease both in animals and man. The author finds that atoxyl and quinine are of no avail as curative agents, but that the mercury inunction, which acts as a prophylactic, together with internal administration of potassium iodide, give good results, causing the fever to fall, the ulcers to heal, and in general acting as a check on the disease, bringing it to a quick termination. L. C. Scott.

The Relation of Growth to the Chemical Constituents of the Diet.—(Journal of Biological Chemistry, xv, No. 2, 1913, p. 311.) Thomas B. Osborne and Lafayette B. Mendel, working with young white rats fed on artificial foods made with purified casein, edestin, or lactalbumin as sources of protein, and mixed in the proportion of protein 18%, lactose 23.8%, starch 29%, milk salts 4.2%, lard 25%, find that growth is normal for about ninety days, when decline takes place and the animals lose weight. As soon as unsalted butter is added to the dietary, normal growth commences again and continues uninterruptedly, several of the females casting litters of normal young. From the results of their experiment, they conclude that there is something in butter which does not exist in lard, which is essential for growth of the young rat, which will thrive on whole milk. The nature of this substance they do not describe, and state that inasmuch as the young animals will thrive normally for ninety days, there is a possibility that this is accomplished at the expense of some reserve substance in the cells of the young animal. That it is not the absence of some inorganic salt seems proven, as these were added in the dietary in the form of milk salt, which contained calcium carbonate, magnesium carbonate, sodium carbonate, potassium carbonate, phosphoric acid, hydrochloric acid, sulphuric acid, citric acid, citrate of iron, iodide of potash, manganese sulphate, sodium fluoride and potassium aluminum sulphate. Such experiments bear on important questions of health and diet in the young.
Allan Eustis.

The Etiology of Japanese River Fever.—(Mitt. der Med. Fakultät der Kais. Universität zu Tokio. Bd. xi, Heft 1, 1913.) M. Ogata devotes the first part of his article to a description of the morphology and cultural characteristics of the Tsutsugamushi thread fungus (Tsutsuga-

Digitized by Google

mushieumycetes probably Askomycetes), illustrating with excellent colored plates. In previous contributions he had noted the presence of many club-shaped spores in the blood and ulcers of those stricken with the disease. These he has repeatedly found in the present series of cases and has made cultures both from abscesses and blood, both of patients and animals, sections of affected lymph glands and even hanging drops showing spores hyphae or conidia. Cultures of fungus from parasites of the field rat, *Salix purpurea*, gave colonies which differed somewhat from those obtained from patients. In the second part the author describes the symptoms, clinical features and treatment with inunctions of mercury combined with the internal administration of potassium iodide, of seven tsutsugamushi patients. He found that those patients taken very shortly after the beginning of the disease, i. e., after the incubation period of ten days, generally could be cured; those, however, undergoing treatment after the disease had been well developed, died. During a previous period of four years the author had treated seventeen patients, of which one died. Of the present series, four were treated during the first stage of fever, bubo and conjunctivitis, and only one died. The author regards the inunction of mercury as a prophylactic measure, and cites his advice given to railway engineers building a road through the affected locality, the banks of the Agano River in Nakasinden. Of the 700 to 800 laborers employed, the majority of whom received inunction, not a single one was attacked by the tsutsugamushi disease. L. C. Scott.

Ainhum as Seen on the Canal Zone, with Report of Interesting Cases Occurring in One Family.—(Southern Med. Jour., October, 1913, vi, No. 10, pp. 651-656.) H. Weinstein, in a short article which greatly adds to our knowledge of this obscure disease, reveals some facts as regards the etiology which has long been one of the puzzles of research workers. Recalling the etiological classification of Wellman (Jour. Trop. Med., London, July, 1906), external injury and self-mutilation play a minor part if any; congenital, spontaneous amputation can possibly be ruled out, as ainhum predominates in individuals past adolesence; anesthetic mutilating leprosy can hardly be considered a factor; scleroderma, on account of its irregularity with reference to the location of the lesion, should not be confused with ainhum, as the following facts will show: According to the author, ainhum (*Dactylolysis spontanae*) is a distinct entity within itself, or a special tropho-neurosis. Its etiology, as yet, is questionable. (Wellman has suggested that the chigger flea, *Sarcopsylla penetrans*, may possibly be a causative factor), but certain influences seem to predominate, such as race, dark-skinned individuals mostly attacked, sex, men almost wholly, heredity, common in families, symmetry and location, the fifth toe in all but a few cases combined with that of the opposite foot and constitutional symptoms lacking; the lesion is also painful, contradictory to the description in

Digitized by Google

text-books. The pathological findings are peculiar and extremely interesting, the keratinous ring, composed of thickened squamous epithelium, rising above the general level of the skin. The tissue distal to the ring seems almost unaffected. The author gives numerous references and illustrates his article with two figures.

P. L. Querens.

The "Wholesale" Treatment of Cholera.—(China Med. Jour, xxvii, No. 5, pp. 302-314, September, 1913.) O. T. Logan, in describing in detail the treatment administered by him and his associates in the recent (1912) cholera epidemic of Changteh, strongly endorses the method of Rogers, or the intravenous hypertonic saline infusion plus potassium permanganate by mouth. He warmly advocates exposure of the median or median cephalic and median basilic veins in order to introduce the solution, or the short saphenous instead if the forenamed are too small to allow a comfortable penetration of the canula. The hypertonic solution of Rogers consists of the following: sodium chloride, 120 grains; calcium chloride, 4 grains; potassium chloride, 6 grains; distilled water q. s., 20 ounces. The solution was allowed to flow in at the rate of about one quart in fifteen minutes, the second quart requiring about twenty-five; in the meantime the patient was carefully watched for any signs of acute cardiac dilation or pulmonary edema. The temperature ranged according to that of the patients: those having subnormal temperatures were given the saline ranging from 102° to 104° F. Those with higher temperatures, that of the solution was lowered, even as low as 74° F., especially for one patient whose fever registered 106° F. on his entrance into the hospital. Potassium permanganate was administered freely in the proportion of 2 grains to the pint, which substituted all drinking water. The author has found that numerous things that are usually discarded about a hospital can easily be made use of in an emergency; canulas being scarse, ordinary medicine droppers were made use of, and even stomach tubes and catheters for rubber tubing, and boards over wooden benches for operating tables. After the introduction of the solution, the radial pulse gradually returned to normal and the cramps in the legs disappeared, and, according to the author: "The quickest anodyne for cholera cramps is saline solution." The color slowly returned to the finger tips and lips and the eyes lost their sunken appearance; even the voice, which at first, being a mere squeak, soon became stronger and stronger. Owing to the emergency, completed records of each case were impossible, as only a small percentage were in-patients, the rest merely attending the hospital for the injections. Nevertheless, the results were extremely gratifying to the author. The article is illustrated with five figures. P. L. Q.

The Stable Fly.—(Farmers' Bulletin 540, July 14, 1913.) F. C. Bishopp, in an elaborate paper containing ten illustrations, urges the

Digitized by Google

necessity of decreasing the ravages of this pest, the stable fly (*Stomoxys calcitrans* L.). He gives its history in America, dating possibly from the time of the early colonists, who most probably introduced it from Europe, to the present day, when it is scattered over the whole United States, but most prevalent in the South. The life-cycle is described in detail, and contra to the old idea that flies breed in manure only, this species breeds equally well in straw, especially that of oats left in the fields over winter. According to Bishopp, the flies are most numerous during the late summer and early fall in the Northern States, and practically the whole year in the Southern States. The author gives practically every detail of the economic losses sustained by keepers of live stock, including the severe outbreak of the flies in 1912 which occurred in Northern Texas, when considerable numbers of live stock were killed and an incalculable number depreciated so in health that it was impossible to work them, especially the mules. The length of the life of the adult under artificial conditions, although allowed access to cattle, was found to be 25 days, and the life-cycle was found to vary from 19 days to 43 days during the summer months when food was abundant. Among the natural enemies as mentioned, are those of the immature stages, being hogs, fowls, and two species of wasplike insects which deposit their eggs in the puparia, one of which is scientifically known as *Spalangia muscidarum* Richards, which appears to be widely distributed in this country. Those of the adults include the larger robber flies, wasps and spiders. As regards the artificial control of these pests, Bishopp recommends the burning of all straw, not used for fodder, or scattering it over the land, then plowing it under.. That which is to be used for fodder should be well protected by stacking it tightly, with the sides vertical and well rounded off at the top, as the rain is shed better. A clever trap is recommended by Prof. C. F. Hodge, which is placed in the windows of the stable and thereby intercepts all adults entering and leaving these structures. As a protection for live stock the author recommends the placing of a light covering over the animals, then applying the following mixture to the unprotected parts: fish oil, 1 gallon; oil of pine tar, 2 ounces; oil of pennyroyal, 2 ounces, and kerosene, one-half pint. This must be applied lightly, but thoroughly. A brief résumé of the importance of this insect as a disease carrier is pointed out by Bishopp, it being suspected of transmitting infantile paralysis (Anterior Poliomyelitis), surra, souma, anthrax, glanders, and even pellagra. P. L. Q.

The Nastin Treatment of Leprosy.—(Archiv. für Schiffs und Tropen-Hygiene. Bd. 17, Heft 19, October, 1913.) Max Rudolph considers that the sharp criticisms of Kayser regarding the treatment of leprosy with Deycke's nastin, which is contrary to the experiences of Liemann, Peiper, Neubert, Kupfer, and the author, are the incentive to the publication of an account of the last of the six cases reported at the Seventh Bra-

Digitized by Google

zilian Medical Congress. Five of the latter were really improved, one healed, and one was not influenced by the treatment. The fifth died, in spite of improvement, of phthisis. The sixth case, which up to that time had recieved injections for six months, could be treated for eighteen months longer. His appearance before beginning the treatment can be seen in cuts Nos. 1 and 2. The condition of the patient when received was as follows: Nicolau Viecra, half-breed, 38 years old, ailing for five years. Older brother leper for sixteen years. Father, mother and other relatives healthy. Facies leontina. Eyebrows and lashes fail. Typical dry, scaly, pale, shiny, thin skin over entire body. Psoriasiform lepromas with numerous bacilli, in back of left hand, left forearm and elbow, back and abdomen. Anaethesia totalis of the extensor surfaces of the forearms, the legs, backs of the hands and feet. Irregular anaesthetic zones in back and abdomen. Iritis leprosa dextra. Conjunctivitis leprosa dextra et sinistra. Has not been able to work for two years. Paraesthesia and impotenti coeundi. Diagnosis: fairly severe case of lepra mixta. After six months' treatment with nastin, increase in weight of 5 kilograms. General condition excellent. The face became thinner and lost the bloated appearance and the masklike expression. The lepromas disappeared, leaving slight scars. The skin has become normal in appearance, also the lobes and shells of the ears. Anaesthesia has disappeared and no bacilli are to be found in either secretion from the nose, in the urine, or in the blood. Sticker's iodine test is negative. Even with the above-mentioned results the author cannot regard the patient as cured. Neither can he ascribe the greater improvement to the periods of latency of the disease which so simulate a cure, and which the opponents of nastin therapy use as an opposing argument. During the author's nine and one-half years' experience among lepers, he has never seen such results as with the Nastin therapy, even with salvarsan and chaulmoogra oil used together. The latter he combines with nastin treatment in a new series of cases, giving the oil as per os four weeks, afterwards a weekly injection of nastin for three months. They are allowed to return to their homes, with instructions to report after two months, meanwhile continuing with the oil. The author expects to report the results of the combined method at some future date. L. C. Scott.

Observations on Certain Helminths of Man.—(Transactions of the Society of Tropical Medicine and Hygiene, vi, No. 8, July, 1913, p. 265.) Robert T. Leiper calls attention to the fact that our knowledge, even of the commoner parasites, is far from clear and accurate. To substantiate this statement he has enumerated several examples of inconsistencies, notable among which is the confusion existing in the species *Filaria bancrofti* and *Opisthorchis noverca*. Among the *nova addenda* which Leiper brings forward or confirms is the *Lagochilascaris major* from the East African lion, closely allied to the *L. minor* (Leiper 1910).

Digitized by Google

The practical importance of the *Physaloptera mordens* (Leiper, 1907) is accentuated by the reports of Turner from the Transvaal. Leiper believes the monkey to be the normal "reservoir host." In the *F. peretans* he calls attention to a new pair of papillae which lie midway between the solitary pair and the posterior extremity. In *F. loa*, also, an additional pair of papillae, bilaterally, symmetrical and constant, is noted. W. B. Johnson found 4% of 200 consecutive prisoners in the Zungeru goal, in Northern Nigeria, infected with *Oesophagostomum apiostomun*. The specimens showed no specific differences from *O. apiostomum* in monkeys. The distinct species of *Syngamus kingi* is affirmed. Leiper regards the *Heterophyes yokogawa* (Katsurada, 1912) as a connecting species between the tocotreminae and heterophyinae, which he calls "Yokogawa Yokogawa." O'Connor says the Japanese are infected frequently with the latter, but not other races. The symptoms produced are a mild form of chronic enteritis. The infection comes from eating a small fresh-water fish called the "Ai," which the Japanese eat raw. The Koreans and Chinesce escape infection by cooking the fish. The author calls attention to the deciduousness of the spines of *Fasciolopsis buski*, and states that in many specimens when examined the cuticle is found shed off. As the spines are the distinguishing feature from other species, further research is necessary. Mathis and Leger have found the pig to be the host of the *Gastrodiscoides hominis*, 5% of the pigs of Ammon being found infected. Leiper has received from Uganda and Nigeria a new species of *Gastrodiscoides* from the pig which he proposes to name *G. minor*.

W. H. Seemann.

Digitized by Google

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed

BOOKS.

The Microtomist's Vade-Mecum. By Arthur Bolles Lee. Seventh edition. Philadelphia: P. Blakiston's Son & Co. 1913.

The new edition of this widely used and useful work has been brought up to date by many additions and improvements in the technical processes. The most important improvement is a description of the new mounting media of Gilson—camsal balsam and euparal. With these media specimens may be mounted directly from alcohol, thus omitting the treatment with clearing agents which often injure the tissues or stains. They have the further property of a low index of refraction. Important improvements have been made in the silver fibril stains of Bellschousky and Ramón y Cajal. Their methods for the study of neurofibrils are given at length and recommended as being more reliable than formerly. The sections relating to blood and blood parasites have been largely rewritten. This is undoubtedly one of the best reference works on methods of preparing tissues for examination, and the general chapters dealing with the principles and theories of technical processes are especially valuable. One drawback to the use of this work is the frequent lack of definiteness as to the exact procedure. The variety of substances and methods which may be used in a given case are confusing to many laboratory workers who have not the time or do not care to work out the details of the technique. Another possible criticism is that some useful methods, which have been described in previous editions, are only referred to in this one. The desire to keep the volume to its present small size will excuse in part these omissions. This edition is as usual well indexed and has the convenient numbering of the paragraphs. By condensation of the text and omission of superfluous matter it has even fewer pages than the last (1905) edition.

W. V. King.

Laboratory Methods: with Special Reference to the Needs of the General Practitioner. By B. G. R. Williams, M. D., assisted by Victor C. Vaughan, M. D., LL. D. Second edition, illustrated with forty-three engravings. St. Louis: C. V. Mosby Company. 1913.

That this work should enjoy the high commendation of Vaughan in its introduction is itself enough to demand for it respectful atten-

Digitized by Google

tion. The keynote of the volume is simplicity and it should be of value to isolated general practitioners who have little opportunity to acquaint themselves with modern laboratory technic or to keep abreast of current methods. An attempt is made to make the book interesting reading, as is indicated by such chapter headings as "Searching for Germs," "Vascular Dramas," "Diazo versus Widal," "Every Day Stool Tests," "The Private Post-mortem," etc. The illustrations of apparatus and technic are as a rule good, those of microscopical preparations are more open to criticism. The index is adequate.

Creighton Wellman.

Hygiene and Sanitation: A Text-book for Nurses. By Geo. M. Price, M. D. Philadelphia and New York: Lea & Febiger. 1913. 236 pages.

This book is a simple statement of the main facts and principles of hygiene, with special emphasis on the details that fall within the province of the trained nurse. A recognition of the role of the nurse—the "priestess of prophylaxis"—in preventive medicine is a matter of importance, and that she, herself, should vividly realize her value as a factor in social, civic and other public health activities is more than desirable. Therefore a volume somewhat like the present should be in the hands of every nurse or intending nurse. The volume has an index.

C. W.

JOURNALS.

The special Preventive Medicine Number of the Interstate Medical Journal for October, 1913, deserves the notice of every worker in this great field of endeavor. The subject is discussed in the following most interesting and instructive set of articles by well-known writers and experts: On Instruction in Public Preventive Medicine, by A. C. Abbott, M. D.; Medical Inspection and the Nutrition of School Children, by Ira S. Wile, M. S., M. D.; The History of Preventive Medicine in the South, by Joseph Holt, M. D.; The Educational Function of the State Hygienic Laboratory, by W. A. Sawyer, M. D.; Eradication of Malaria, by C. C. Bass, M. D.; How Far Are Teachers Responsible for the Morbidity and Mortality of School Children?, by Isaac A. Abt, M. D.; Public Health for Undergraduates in Medical Colleges, by Paul Gerhardt Woolley, M. D.; Public Health Work Compensates a Community, by Harold B. Wood, M. D.; Inspection No Cinderella, by Oscar Dowling, M. D.; The Practitioner in His Relation to Public Health Questions, by Isadore Dyer, M. D. The editorial pages of this issue deal with topics germane to the subject of the special number and collective abstracts by members of the editorial staff on such subjects as: The Prevention of Speech Defects in Children, by Wm. B. Chamberlin, M. D.; Hygiene of Infancy and Childhood, by Alfred Friedlander, M. D.; Improper

Digitized by Google

School Seating and Scoliosis, by Nathaniel Allison, M. D., complete a most significant and creditable whole. That an independent journal designed for the general practitioner should issue such a broad and unselfish piece of propaganda is indicative not only of the high ideals of its editors, but also of the intelligence of its professional readers, who have been considered in the preparation of such a special number and who are to be congratulated upon the compliment thus paid them.

C. W.

REPRINTS.

Clark, Taliaferro. An Investigation of the Prevalence of Trachoma in the State of Minnesota. Reprint No. 134 from Public Health Reports.

Creel, Richard H. Outbreak and Suppression of Plague in Porto Rico. Reprint No. 130 from Public Health Reports.

Creel, Richard H. The Rat: A Sanitary Menace and an Economic Burden. Reprint No. 135 from Public Health Reports.

Fischer, Martin H. Further Response to Some Criticisms of the Colloid-Chemical Theory of Water Absorption by Protoplasm. Reprinted from The Journal of the American Medical Association. October 19, 1912. Vol. LIX, pp. 1429-1433.

Fischer, Martin H. Treatment of Nephritis and Allied Conditions. Reprinted, with additions, from The Journal of the American Medical Association. May 31, 1913. Vol. LX, pp. 1682-1690.

Fischer, Martin H., and Sykes, Anne. Non-Electrolytes and the Colloid-Chemical Theory of Water Absorption. Reprinted from Science, N. S., Vol. XXXVIII, No. 979, pp. 486-487, October 3, 1913.

Fischer, Martin H., and Sykes, Anne. Uber die Kolloidchemische Wirkung der diuretischen Salze. Sonderabdruck aus der "Kolloid-Zeitschrift," Heft 2, Bd. XIII.

Fricks, L. D. Rocky Mountain Spotted (or Tick) Fever. Reprint No. 139 from the Public Health Reports.

Stiles, Ch. Wardell. Hospital Relief for Rural Districts. Reprint No. 115 from the Public Health Reports.

Strietmann, William H., and Fischer, Martin H. On the Contraction of Catgut and the Theory of Muscular Contraction. Reprinted from Kolloid-Zeitschrift. 1912.

Trask, John W. Municipal Ordinances, Rules, and Regulations Pertaining to Public Health. Reprint No. 121 from Public Health Reports.

Walker, Ernest Linwood. Experimental Entamoebic Dysentery. Reprinted from The Philipine Journal of Science, Vol. VIII, No. 4, Sec. B., Tropical Medicine, August, 1913.

PRINTED AT THE TULANE UNIVERSITY PRESS, NEW ORLEANS, U. S. A.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CREIGHTON WELLMAN, M. D. ..... EDITOR-IN-CHIEF
CHARLES CHASSAIGNAC, M. D.
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine
JOHN M. SWAN, M. D., Secretary, American Society of Tropical Medicine } *Ex officio.*
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M, D., University of Pennsylvania.
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. DECEMBER, 1913 NO. 6.

EDITORIAL

The Duty of the Federal Government in Leprosy.—We read with considerable interest that the Public Health Service in the Philippines has successfully treated leprosy, and while the official report of the officer in charge, Dr. Heiser, does not so state, we are especially gratified that the method employed is that proposed at the Louisiana Leper Home now some seventeen years ago. Unofficially, Dr. Heiser has frequently indicated his obligation to the Louisiana Home for the present methods employed in the Philippines—all of which brings us to our subject.

Several attempts have been made to create an interest in the care of leprosy in the United States as a government proposition, and each time the result has been for the bill or act of Congress to die in committee, while Congress has promptly authorized the expenditure of many thousands of dollars for experimental work at Molokai or Honolulu, and, in the Philip-

Digitized by Google

pines, the Public Health Service has so systematized the provisions for leprosy that several asylums have been erected on different islands and something over 5,000 lepers have been confined.

Louisiana, Massachusetts and California have undertaken state control of leprosy, but the very fact that these points, so widely separated, should need to take such action, argues that the many other points in the United States must, more or less, as well, need provision.

The numerical importance of leprosy has been repeatedly urged, and in spite of the casual reports of the Public Health Service from time to time, the disease is increasing in this country.

It is foolish to draw up statistics from State Board of Health records, when there is so much open attempt to hide the disease. More than thirty per cent. of the United States at this time have leprosy, and it is only a question of time when the disease will be universal, if nothing is done to check it.

It is now more than evident that the existing conditions within the United States do not appeal to either the constituted federal health authorities nor to the United States Congress, but that there is some obligation ought not to be a matter of needed argument.

We are directly in touch with Hawaii, and the Philippines, where leprosy prevails; we are equally in contact with Porto Rico and Central America, where our interests lie closer all the time. The west coast of South America is full of leprosy, the United States of Colombia alone estimating its lepers some years ago at 20,000.

The likelihood, then, of imported leprosy is great now and will grow greater all the time. That such cases have been already introduced into this country is well established, and this statement may be readily verified by the printed reports of any

Digitized by Google

society in New York City before which leprosy cases are presented; they evidently pass the port of entry without hindrance.

If the government can supply the tributary island possessions of our country with funds wholesale for the experimentation with and the care of leprosy, why cannot some provision be made at home, where the need grows all the time? It will be far easier to take care of 1,000 lepers now than 10,000 a few years from now. Moreover, there is a greater opportunity to conduct experiment in this country than in any of the island possessions. In the first place, there are more scientific men interested in leprosy who would be willing to work at the problems, and the cost of experimenting would be materially less from every point of view.

We commend to the Public Health Service the task, as properly theirs, to undertake first an adequate hospital provision for lepers in this country and the attack upon the question of a treatment which may be effective in more cases than experience hitherto has proven with known remedies.

Incidentally, and finally, the United States is the only government of any importance which is doing nothing for the lepers in its confines. *Isadore Dyer.*

Rice in the Diet of Americans.—The United States Department of Agriculture, in a recent bulletin issued from its Office of Information, endeavors to set the people right on the question of eating polished and unpolished rice. It should be very gratifying to the members of the American Society of Tropical Medicine, whose articles on the subject have been published in this JOURNAL, and especially to the workers in the laboratories of the School of Tropical Medicine of Tulane, whose researches in this line have been so edifying, to see that the government authorities have adopted their conclusions.

The bulletin calls attention to the fact that those who decry

Digitized by Google

the use of polished rice base their opinion on investigations made in Oriental countries where rice is almost the chief staple of a limited diet, with scarcely any other starchy food. They might be expected to need certain elements of the rice that come off in the polishing. However, Americans are far from living on a rice diet; hence there is no logical reason why they should not use either polished or unpolished rice as their taste may direct. As the bulletin puts it very forcibly, "both are wholesome and valuable."

The dread of polished rice should be entirely dispelled once and for all by this official confirmation of the conclusions reached by our local experts. *Charles Chassaignac.*

Tropical Medicine and Medical Missions.—A large number of workers in tropical countries seem to be unaware of the fact that an enormous use of our knowledge of tropical medicine is being made daily by men and women engaged in missionary endeavor. It is not less true that some of the best research in this field has been accomplished by those engaged in the conduct of medical missions. Throughout the tropical and subtropical world a large number of earnest workers are devoted to the practice and teaching of scientific medicine among peoples who otherwise would be debarred from the blessings which modern medicine offers to human sufferers. Taking China as an example: in this nation there are over five hundred men and women who are engaged in the conduct of several hundred dispensaries and hospitals administered according to modern ideas. Among these representatives of our profession are Americans, British, Germans, and those of other nationalities. The China Medical Mission Association meets triennially for exchange of opinions, announcement of results of research, and conferences regarding the needs and problems of a tremendous undertaking. The China Medical Journal has been published bimonthly

Digitized by Google

for many years and is the official organ and medium for the exchange of information and opinion among the members of this association. A publishing and terminology committee has also for years been engaged in the task of preparing a definitive list of technical, medical and scientific terms in Chinese and in the publishing of student works on the science of medicine, including an English-Chinese medical lexicon, published a few years ago, the second revised and enlarged edition of which is soon to be published. Text-books on the various medical subjects have been translated, including standard works on anatomy, physiology, chemistry, materia medica and therapeutics, surgery, pediatrics, practice of medicine, gynaecology, obstetrics, opthalmology, hygiene, nursing, etc. A journal conducted by missionaries and Chinese physicians is published in Chinese, and other similar activities obtain throughout many parts of the empire. The pioneer missionaries were compelled to build, equip, and conduct hospitals with more or less inadequate equipment and assistants. While thousands of patients were treated and the practical benefits of the work were large, but little opportunity for research was open to them. Several years ago, however, a research committee was formed and a large amount of valuable work has been accomplished on the investigation of the nematodes, trematodes, cestodes and bacterial affections common to that part of the world, such diseases as plague, cholera (in the last number of this JOURNAL, Dr. Logan reports over five hundred cases of this disease treated in six weeks according to modern methods), typhus (four foreign physicians sacrificed their lives in an epidemic of this disease in 1912), and other tropical and subtropical affections. The Red Cross work during the recent revolution, in which missionary physicians took so prominent a part, needs only to be mentioned. The result of such activities has been a gratifyingly friendly attitude of the people and government toward missionary phy-

Digitized by Google

sicians and missionary work. During the past, each missionary physician was compelled to train his own assistants and solve his own problems. Now, however, a wise policy of coöperation and concentration has been embarked upon. The fraternal union of the different denominations has made possible such work in China and established modern medical schools in some of the large centers of the empire. These teach physicians according to American and European standards and train the Chinese to help themselves, the aim being to give the best education possible and also to place the student during his period of study under the best type of Christian influence. Our countrymen and our European confrères uniting in this work need money for the equipment and building of such institutions as have been mentioned in this editorial. More medical men and women with missionary spirit are called for, and trained nurses, of which but too few have entered this field, are also required. To young men or women with a desire to devote their lives to a Christian and humanitarian cause, no field of endeavor could be more attractive than China or some one of the other great fields, such as India or Africa, which are to-day open to the service of those who believe in the blessings which should follow the teaching and practice of modern scientific medicine and in the many other beneficent results which should flow from the introduction of the best elements of American and European Christian civilization among foreign nations.

Creighton Wellman.

Digitized by Google

ORIGINAL ARTICLES

THE EFFECTS OF CERTAIN DRUGS ON THE PATHOGENIC ENTAMOEBAE OF THE HUMAN INTESTINES,

With Special Reference to the Action of Bismuth Subnitrate in Large Doses, and to the Hypodermic Injection of the Hydrochloride of Emetin.*

W. M. JAMES, M. D.,
Ancon Hospital, Ancon, Canal Zone.

The publication last year by Leonard Rogers of the brilliant results obtained by him after the use of the hydrochloride of emetin hypodermically has been followed by a number of reports which, as far as I can judge from the literature at my disposal, confirm fully the expectations raised by the preliminary notices. Not only have amoebic dysenteries of all degrees of severity apparently been cured with a rapidity almost magical, but amoebic abscesses of the liver intractable to previous remedial methods have readily healed as well.

Rogers' method has been tried recently in Ancon Hospital, and Dr. W. E. Deeks, Chief of Medical Clinic, reported to the Canal Zone Medical Association at its July meeting the favorable results obtained in several cases of dysentery due to infection with *Entamoeba histolytica,* and also in two cases of amoebic abscess of the liver. These cases of liver abscess belonged to a type previously described by Dr. A. B. Herrick, Chief of Surgical Clinic, Ancon Hospital, in which there is progressive destruction not only of the liver substance, but also of the structures of the adjacent chest wall. I am informed by Dr. S. T. Darling, Chief of Board of Health Laboratory, that this destruction depends upon the activities of the entamoebae in a manner similar to the production of lesions elsewhere by

*Received for publication November 7, 1913.

Digitized by Google

these organisms. In one of these cases I recovered the entamoebae in large numbers in scrapings from the chest wall. When such a type of abscess is present, formerly the prognosis was uniformly very grave indeed.

Dr. Deeks was much impressed with the favorable action of the emetin, especially in the cases just cited, and in his paper stated that such results could be obtained only by a specific action of the drug against the entamoebae. At his request I took up the study of the effects of the emetin on the organisms, since none of the literature at my disposal makes any mention of the effect of the drug on the biology of the entamoebae, except Rogers' statement that 3½ grains administered over two and one-half days, in a very severe and fatal case of amoebic dysentery, was so effective that not a single organism could be found at autopsy, even though a most careful search was made of scrapings and sections of the gut.

Through the courtesy of Drs. Prather and Monroe, of the medical staff of Ancon Hospital, I could follow several cases of amoebic dysentery from the time of the administration of emetin until the organisms had disappeared from the stools, and later, until the patients were discharged. The entamoebae were carefully studied in fresh preparations, and in preparations wet-fixed in Schaudinn's solution, and stained by iron-hematoxylin and by Mann's stain. Wet fixation is absolutely necessary if there is to be any accurate study of cytological detail in organisms so small and so delicate as are the entamoebae.

Before presenting my observations and the conclusions based upon them, I wish to bring forward some facts in regard to the treatment of amoebic dysentery, and the results obtained by the use of various drugs.

A consideration of the pathology of amoebic dysentery, and that of amoebic abscess of the liver, demonstrates very plainly that to be effective against the entamoebae a drug must attack these organisms directly or indirectly in the intestinal walls, or in the substance of the liver. Entamoebae found in the stools are either surplus parasites, which have not yet made their way into the glands of the large intestine, or they are parasites thrown off with the exfoliation of the intestinal mucosa; but in

Digitized by Google

either case a persistence of the organisms in the lumen of the large bowel leads to continued infection of the walls of the gut.

Hypothetically, there are three ways in which a drug may attack the entamoebae.

1. It may be taken by mouth, by the systemic circulation (hypodermically or intravenously), or by rectal injection or irrigation, and by reason of a specific action against the entamoebae, similar to that of quinine against the malarial parasites, destroy the organisms *in situ*, being taken up, perhaps, in combination with whatever product of cell metabolism they use as food supply, or perhaps acting as a direct cytoplasmic poison.

2. A drug may be given by mouth, or by the systemic circulation, and in the process of excretion into the lumen of the bowel, kill the entamoebae as above described. Dr. C. M. Wynne, formerly pathologist to Santo Tomas Hospital in the City of Panama, reported the effects of salvarsan in twelve cases of amoebic dysentery, with remarkably favorable results. Following the intravenous injection of this drug Dr. Wynne demonstrated arsenic in the stools of his patients from as early as five hours later, to eighteen days afterward. Later observers have confirmed Dr. Wynne's report, but personally I have not tried this drug as yet. Dr. Wynne attributed the success of salvarsan either indirectly to its combination with erythrocytes, which the entamoebae phagocyte freely, or to the toxic effects of the drug on the organisms, in its passage through the walls of the large bowel.

3. A drug may be given by mouth or by rectal injection, and in the lumen of the bowel attack the entamoebae, (a), by combining with some product of digestion necessary to the nutrition of the entamoebae and so inhibiting their food supply, or (b), it may kill the organisms by direct contact. By neither method of attack would a drug directly affect the entamoebae within the intestinal walls; but one may suppose, since a vast number in the lumen of the bowel are killed, thereby preventing further multiplication and continued infection of the intestinal mucosa, the protective forces of the body, whatever these may be, can deal satisfactorily with the infection within the wall of the gut.

Digitized by Google

Each of the therapeutic methods given above appears to have had some justification, since good results have been reported by competent observers. None the less, there has been for many years a very heated controversy as to the best method of treating amoebic dysentery, which disease in certain parts of the Tropics has been a veritable scourge to white races. The disconcerting percentage of relapses, liver abscesses, and deaths, showed all too plainly that notwithstanding the remarkable efficacy of some of the methods of treatment proposed, which efficacy was only too often confined to the reports of those who originated the treatments, claims for a specific remedy could not be substantiated. With regard to this point, the observations of Capt. C. F. Craig, Medical Corps, U. S. Army, in his recent paper, are of interest. He states that in 1902, at the U. S. Army Hospital in San Francisco, hundreds of patients suffering with amoebic dysentery were received, who had been invalided there from the Philippines, and these were returned because of the severity and intractable nature of the entamoebic infections from which they were suffering. All were under treatment by means of rectal irrigations of quinine and other substances destructive to the entamoebae. Despite daily treatment, a considerable proportion of these infections terminated fatally, while that that apparently recovered frequently relapsed, and in many instances the relapse proved fatal also. Dr. Craig then reports a case in which the dysentery was contracted in 1903, and which was treated from 1909 to March, 1913, with ipecac, and with quinine irrigations, during which time there were several relapses. He also states that co-incident infection with *Entamoeba coli* in non-amoebic dysenteries has undoubtedly led to confusion as to etiology, with consequent unsubstantiated claims for marvelous results produced by certain drugs. To anyone familiar with the difficulty of differentiating between vegetative forms of *Entamoeba coli* associated with diarrhoea or with non-amoebic dysentery, and certain phases of the pathogenic entamoebae, Dr. Craig's statement will appeal with particular force.

And I may add that not at all infrequently amoebic dysenteries untreated with drugs, but given solely a restricted diet and

Digitized by Google

rest in bed, will go on to apparent healing and cure, just as malarial infections will subside under the same procedure. The apparent improvement will be as rapid in some instances as that reported even after emetin. Yet just as relapse will almost inevitably follow a malarial infection handled in this manner, so it will appear later in an amoebic infection. And just as claims are made for drugs other than quinine as cures for malaria, when an equal improvement can be observed without any medication whatsoever, so the apparent cures said to follow the specific action of certain drugs in amoebic dysentery may very well be due to the restricted diet on which nearly all such cases are placed. Following the administration of a small dose of Epsom salts to obtain specimens, I have often observed a very marked amelioration of symptoms in an acute attack of amoebic dysentery.

These facts will make it clear why so-called cures have followed the administration of many different drugs, and will explain the diversity of opinion as to the efficacy of certain drugs which at times have given good resuts. But in the consideration of any method of treatment two factors must constantly be kept in mind: (a) the exact effect of the drug or drugs used on the entamoeba, and (b) certainty of diagnosis. These factors have frequently been overlooked, and indeed even in the careful descriptions of the entamoebae by the German writers one looks in vain for a precise description and accurate illustrations of the effect of treatment on the organisms, while more than one account of the entamoebae found by various authors raises doubt as to whether pathogenic or non-pathogenic species were in question. It is for this reason that I have for the past two years studied as carefully as was in my power the morphological and biological changes brought about in the entamoebae by various drugs, in the endeavor to demonstrate which method or methods of treatment produce the most far-reaching and permanent changes in these organisms. There is a very marked analogy between the response of the malarial parasites and of the entamoebae to treatment, and the same principles of treatment used against the former I have found to apply with equal force against the latter. To prevent relapse in malaria one

Digitized by Google

must eliminate the *Plasmodia* as rapidly and as certainly as possible, as pointed out by me in a recent communication, and the same holds true also of a proper treatment against the entamoebae.

In the long-continued controversy as to the proper method of treating amoebic dysentery, there was no greater dispute than that which had to do with the administration of ipecac. The details of this dispute are familiar to every student of tropical medicine, and there is no reason to repeat them here. It cannot be denied that the use of ipecac was not seldom followed by excellent results, and it is equally certain that many times the drug failed in its action. Finally it was claimed that ipecac is effective in proportion to the content of one of its alkaloids, emetin; and that this is true has been shown by the much greater success following the administration of ipecac known to contain definite quantities of this alkaloid. None the less, failures not infrequently followed the employment of a preparation known to contain relatively large quantities of emetin, and given after the methods advocated by those in whose hands ipecac had produced the best results. Recently Leonard Rogers, who has been for years a staunch upholder of the merits of ipecac, having convinced himself that its favorable results were due to the emetin content, gave the alkaloid hypodermically. He reported remarkable cures, and, as I have stated, from the accounts which followed his publications, there is every reason to believe that to this brilliant and thorough worker in tropical medicine fresh laurels should be awarded.

It cannot be overlooked, however, that at present there is a treatment other than the administration of emetin which has given most excellent results, far surpassing those obtained prior to the initiation of the emetin treatment.

I refer to the method of administering the subnitrate of bismuth in very large doses, a heaping teaspoonful (about 3 drams) every three or four hours, as first originated six years ago by Dr. W. E. Deeks. The statistics of this treatment were given in 1910 by Drs. Deeks and Shaw, and were recently brought to date by Dr. Deeks. These statistics, extending over five years, show in properly treated cases a very high percent-

Digitized by Google

age of recovery, and many of the patients have been under personal observation from three to five years without manifesting any indication of either relapse or of liver abscess. In discussing the effects of bismuth on the entamoebae, it will be well to compare these effects with those brought about by the action of emetin, since the two drugs differ decidedly in the manner in which they attack the organisms.

It was thought at first that the bismuth acted as a direct poison to the entamoebae. Dr. S. T. Darling stated, however, in a communication before the Canal Zone Medical Society, that he had cultured free living species on media sown with bismuth. It was then suggested that perhaps bismuth was fatal to certain bacteria, a symbiosis with which was necessary for the life of the entamoebae. At the request of Dr. Deeks, Dr. Darling investigated this hypothesis, but found no evidence of any such specific action. It was noted in this investigation that some species of bacteria combined with the bismuth, the sulphur of their cytoplasm taking on the deep black stain of sulphide, with which substance the crystals of bismuth subnitrate in the stools were also coated. Dr. Deeks reasoned from this that probably the bismuth combined with certain products of intestinal digestion, perhaps of bacterial origin, which were necessary for the life of the entamoebae. The appearance of the organisms after bismuth has been exhibited strongly substantiates this hypothesis. The organisms free in the lumen of the large bowel are destroyed almost as soon as the bismuth appears in any quantity in the stools. Since pure bismuth subnitrate is practically insoluble in the alimentary canal, the chief alteration being the conversion of the surface of the crystals to a sulphide of bismuth, the destruction of the entamoebae in the walls of the gut by absorption of the drug is unlikely. Yet the intramural entamoebae certainly perish rapidly and in great number. Either they die from some unknown cause and since further multiplication in the lumen of the bowel and consequent continued reinfection are inhibited, the disease is checked, or else, like those free in the intestinal canal, they perish from lack of further absorption from the lumen of the bowel of a suitable food supply, their longer vitality being due to a certain amount

Digitized by Google

of food available after the initiation of the bismuth treatment. There is no doubt but that the food supply of the entamoebae is a highly specialized substance, as is demonstrated by the entire failure up to the present successfully to cultivate these organisms on artificial media, or at least to cultivate them in such a manner that they can be identified as entamoebae, and not free living species.

When I read Dr. Deek's last paper on the treatment of amoebic dysentery at the 1912 meeting of the American Medical Association, in the discussion Dr. Mix of Chicago offered the interesting suggestion that sulphur in the form of nascent hydrogen sulphide in the intestine may be an essential of entamoebic life. He stated that in certain experiments with free living amoebae he had obtained greatly increased proliferation by adding sulphur to his media. The alteration of the surface of the bismuth crystals is due to the action of the hydrogen sulphide of the bowel on the subnitrate, and this, as far as Dr. Darling could determine, is the only alteration in the drug. Given in the very large doses insisted upon by Dr. Deeks, it may not be improbable that the bismuth subnitrate takes up sulphur as fast as this is formed as the sulphide of hydrogen, and so may deprive the entamoebae of an essential element of their food supply.

I cannot state in what manner quinine and thymol irrigations affect the entamoebae, since this barbarous method of treatment was discontinued in Ancon Hospital over five years ago. As I noted in a previous communication, if by any chance there had been an error in the diagnosis of amoebic dysentery, or if patients were treated to eliminate pathogenic entamoebae with which they were not infected, then acute dysentery not present prior to the initiation of the irrigations would certainly follow their exhibition. Craig's statements quoted above as to the results following the use of these irrigations, and our own experience with relapses and liver abscesses in the days when this method was in use here, are ample evidence to me of its entire worthlessness. Perhaps improvement took place in some instances when these irrigations were used—the power of resistance in some patients is such that they will get well with any kind of treatment—but I am convinced that improvement did

Digitized by Google

not follow more often, nor perhaps as often, as I have seen it follow with rest in bed, and a restricted diet.

* * * * * * * * * * *

To come now to the direct observation of the effects of bismuth and emetin on the entamoebae, it is necessary briefly to describe the appearance of normal organisms, and then to take up the changes following the administration of these drugs. I shall describe only the appearance observed after wet fixation and staining, since in the living organisms these are not defined with that sharpness necessary to accurate observation. And dry fixation followed by one of the Romanowsky methods, while a very excellent method for differential identification, does not give accurate detail of the finer structures.

If smears from stools of acute untreated amoebic dysentery are wet fixed, and stained by iron-hematoxylin or by Mann's stain, the entamoebae present a remarkably uniform and characteristic picture (upper left hand figure). An examination of the cytoplasm shows a structure made up of a faintly staining material, the ground substance, in which are many delicate granules of varying size. These granules are arranged in the form of a network with more or less thickened meshes, between which the ground substance appears as alveoli of irregular shape and size. Occasionally true vacuoles without inclusions are encountered, but for the most part the vacuoles contain erythrocytes, and less frequently, bacteria, or remains of intestinal cells and their nuclei. The margin of the organism shows as a well-defined line. Depending on whether the entamoeba is of the *histolytica* or of the *tetragena* type, the oval or circular nucleus contains a round, sometimes irregularly shaped, darkly staining body, the karyosome, which surrounds a smaller, densely staining body, the centriole. In the *histolytica* type of nucleus, which is seen most frequently in acute dysentery or in an acute relapse, the karyosome is relatively small and stains lightly. In the *tetragena* type, the karyosome is very well defined, with a definite outer margin made up of fine granules of chromatin. When at rest the centriole stains densely, and appears as a well-defined circular body, but this appearance is lost in the

Digitized by Google

various stages of mitosis. The margin of the nucleus appears as a delicate, light-gray line, the nuclear membrane, on which grains or blocks of chromatin are arranged in more or less profusion. Between the membrane and the karyosome is a very delicate, feebly staining substance, the achromatinic or linin network.

As a control of degeneration caused by bismuth and emetin, I have used preparations placed in a moist chamber for one or two hours before fixing and staining. This demonstrates what might be called natural degeneration, as contrasted with the artificial degeneration brought about by the specific effects of drugs. I may add here that it was not until I used this moist chamber method that I saw the so-called budding forms of Schaudinn, which were erroneously interpreted by him as reproductive phases of the entamoebae.

In the moist chamber degeneration is shown by a decided vacuolization of the cytoplasm (upper right hand figure), with a loss of the delicate alveolar spaces. In the nucleus, the linin network loses its definition, leaving a very clear intra-nuclear space, against which at first the chromatin shows plainly. The chromatin collects in large blocks on the nuclear membrane, and the karyosome is no longer well defined, although the centriole remains quite distinct. Later the chromatin no longer reacts to the stain, and the nucleus is indistinct, and in the end stages often it is almost invisible. Extrusion of the nucleus is also not infrequently encountered. Sometimes the chromatin breaks up into very small granules, which show a progressive loss of staining reaction.

Finally, the entire organism loses coherency of structure, and the latest stage that can be determined is a very faintly staining oval or circular body, which appears as a ghost of its former self. The degeneration is uniform, and all parts of the entamoeba appear to be equally affected. An interesting occurrence is the formation of the so-called chromidia, which after iron-hematoxylin appear as rods and needles of densely staining substance, sometimes quite filling the cytoplasm. These chromidia are said to be given off by the nucleus prior to cyst formation, but for reasons which will be given in a later com-

Digitized by Google

JAMES ENTAMOEBAE

EXPLANATION OF PLATE

Upper left hand figure: Normal entamoeba, *histolytica* type. Note the delicate alveolar cytoplasm; the arrangement of the nuclear chromatin; the minute karyosome and the densely staining centriole. The linin network of the nucleus is plainly visible, The black inclusions within the vacuoles are phagocyted erythrocytes, some of which are out of focus.

Upper right hand figure: The appearance of an entamoebae from the same infection as upper left hand figure, after the bismuth has appeared in the stools. The same appearance is seen in preparations from the moist chamber in the early stages of degeneration. The cytoplasm is vacuolated and no longer is delicately alveolar. The chromatin is collected in blocks on the nuclear membrane. The karyosome and centriole cannot be differentiated. The linin network of the nucleus is indistinct and not differentiated. The entire nucleus is swollen.

Lower left hand figure: From an infection in which the entamoebae before treatment was initiated were of the *histolytica* type. An entamoeba after the administration of two grains of emetin. The nucleus shows well marked granular degeneration. The karyosome is well marked, but there is no visible centriole. On exact focussing the homogeneously stained material of the nucleus resolved into fine granules. The nucleur membrane is indistinct. There is beginning reticulation of the cytoplasm.

Lower right hand figure: From the same infection as lower left hand figure. An entamoeba after the administration of six grains of emetin. Marked degeneration of the nucleus; reticulation of the cytoplasm, and appearance of inclusions.

The preparations from which these figures were drawn were wet fixed in Schaudinn's fluid and stained by Heidenhain's Iron-hematoxylin method. The figures were drawn with the aid of a Bausch and Lomb Abbé drawing apparatus. A 2 mm. Zeiss apochromatic objective and a No. 12 compensating eye piece were used. Initial magnification x 1500, actual magnification, x 1800.

Digitized by Google

Digitized by Google

munication I doubt very much if they are nuclear products at all, but rather I am inclined to the belief that they are formed from the cytoplasm, although certainly in the normal cycle of the entamoebae their formation is prior to the appearance of the cysts.

At the time when the bismuth crystals appear in quantity in the stools, the entamoebae show changes precisely similar to those described above, except that the budding forms are very rarely encountered, and the so-called chromidia formation, unless already present, does not occur. Occasionally normal individuals are met with, and these are very likely those which have escaped or which have been thrown out from the walls of the gut into the lumen just before the stool was passed.

Entamoebae are very seldom met with in the stools after the second day of bismuth treatment. But at times normal individuals may be found as late as five or six days. I once saw them in great numbers on the seventh day of treatment. These, I believe, were thrown into the intestinal lumen by the opening of infected areas in which the food supply of the organisms had been sufficient to keep the organisms in normal condition. Dr. Deeks has shown that it is necessary to continue the large doses of bismuth until the stools are thoroughly formed. Only once, in my experience, was the administration of bismuth without effect, so that the cycle of the entamoebae went on to cyst formation.

The changes following the administration of emetin differ markedly from the preceding.

After as small an initial dose as one-sixth grain, the cytoplasm appears to become more granular, and again there is a loss of the delicate alveolar structure.

The nucleus is swollen, and the chromatin, instead of collecting in large blocks and grains on the nuclear membrane, begins to form in fine granules, sometimes collected in a cap at one pole, or in caps at both poles, and at other times distributed through the nucleoplasm. The karyosome does not disappear, but on the contrary increases in size, with a very well-defined margin accentuated by the peripheral distribution of chromatinic granules. At this time the karyosome is better defined, and

Digitized by Google

contains more chromatin than I have observed in normal entamoebae (lower left hand figure).

The latest stages observed were on the fourth day, after the exhibition of two to four grains of emetin. Then very marked changes are noted. There is a definite granular degeneration of the nucleus. The chromatin, the enlarged karyosome, and the linin all appear as granules, and the nuclear membrane shows mostly as a peripheral collection of chromatinic dots. The cytoplasm stains feebly, and what appears to be delicate fibrils are distributed through it, so that it presents the appearance of a very fine reticular tissue, with spaces of varying size. This appearance is never seen in normal entamoebae, nor in moist chamber degenerating organisms. The end stage appears to be a granular disintegration of the nucleus and a fibrillar disintegration of the cytoplasm. Many of the entamoebae in this stage contain varying quantities of delicate dots and threads, but I have not determined as yet whether these are bacteria that have invaded the dying parasites, or whether they are the so-called chromidia forming in the cytoplasm, such as occurs in moist chamber specimens (partly shown in lower right hand figure).

Notwithstanding very careful searches through many preparations, I have never found a normal entamoeba after the third day of emetin, although I have encountered degenerating organisms as late as the seventh day, after five to seven grains of emetin had been given. After the stools are formed, one does not find the entamoebae, and it takes patient search to find them in the liquid stools. One must search small portions thoroughly for particles of mucus (it is useless to look in the liquid portion), and examine these one at a time. Sometimes an entire stool will give only three or four threads of mucus, and only one of these will show entamoebae. But with such a search, I have always found organisms for at least three days after the beginning of the treatment.

These observations, which will be extended later, and of course must be confirmed before they will be accepted, suggest to me that the disintegration of the entamoebae following the exhibition of large doses of bismuth is a mechanical one, since such disintegration is practically identical with that seen in the

Digitized by Google

moist chamber, and is probably brought about by the inhibition of a certain necessary food supply of the entamoebae. This food supply possibly may originate as a product of intestinal metabolism, and when it is no longer taken up by the cells of the intestinal walls, the intra-mural entamoebae also perish from inanition.

On the other hand, the appearance of the entamoebae after the administration of emetin suggests that the drug is a specific poison against them. The fragmentation of the nucleus and the broken-up appearance of the cytoplasm are not unlike the changes seen in the malarial parasites after the administration of large doses of quinine.

It is too early yet to predicate the effect of the emetin on the total number of the entamoebae. But there can be no question whatever as to its value in temporarily relieving the symptoms of amoebic dysentery and of amoebic abscess of the liver. With one exception, the results reported by observers have been uniformly favorable. In the American Journal of the Medical Sciences for October, 1913, the following abstract is found:

"Baermann and Heinemann (Munch. med. Woch., 1913, lx, 1132, 1210) have used emetin in the treatment of twenty-two cases of amoebic dysentery. They consider it a most efficient remedy, *although only six of the twenty-two cases were cured* (italics mine.—W. M. J.). The best resutls were obtained by injecting intravenously 150 to 200 milligrams in 100 c. c. of salt solution, repeating the injections after eight to ten days. It is also necessary to supplement the intravenous injections by four or five subcutaneous injections of 100 to 150 milligrams at two or three day intervals. This after treatment should be repeated at intervals of three or four weeks. Baermann and Heinemann believe that this treatment is more successful in the early cases. A great number of cases relapse and the examination of the stools for amoebae should be kept up for months. This treatment is based upon rational therapeutics, as it has been found that ipecac has a specific action against the amoebae. However, ipecac cannot be given in sufficiently large doses on account of untoward by-effects. Emetin is an alkaloid derived from ipecac which Rogers has used with brilliant success in the

Digitized by Google

treatment of amoebic dysentery. A dose of emetin containing seventy times the usual dose of ipecac can be given without any untoward by-effects. Baermann and Heinemann state that the maximum intravenous dose is 250 mg. per 60 kg. of body weight."

Except in so far as amelioration of symptoms be taken into account, it is rather difficult to accept a series which shows only 6 out of 22 cases, or 27 per cent., as cured, as indicative of any particular success in the treatment of amoebic dysentery. An analysis of the doses used shows that Baermann and Heinemann gave an initial dose of 2 to 3 grains intravenously, repeating it in eight days. In the interim and later four or five 1½ to 2 grain doses are given at intervals of two to three days. Such a procedure may be compared to giving an intravenous dose of 30 grains of quinine at the beginning of an attack of malaria, and again eight days later, and supplementing it with hypodermic injections of from 15 to 20 grains at intervals of from two to three days. Quinine in such doses would undoubtedly, in my opinion, leave many residual parasites, although the immediate attack might be suppressed, and a relapse would surely follow, and I would by no means consider such a course of treatment as "rational therapeutics."

Rogers gives one-half grain as the initial dose, and then from one to two grains daily until the symptoms have stopped.

The well-known studies of Ehrlich with respect to the immunity obtained by various protozoa against the drugs used to combat infections with them have led to the belief that when means are available the protozoa should be killed as rapidly as possible, in order that no residual protozoa, immune against the drug or drugs employed, should remain. The employment of a drug in as large a dose as possible, and repeated as often as is consistent with safety, is known as the *therapia sterilizans magna,* and such use of a drug has been shown in malaria and in syphilis to be the most effective method.

For this reason we treat our cases of amoebic dysentery and of liver abscesses by employing the emetin in as large an initial dose as possible, push it as rapidly as we can to toleration, and keep it there until we are satisfied that as far as we know the

Digitized by Google

infection has been eliminated. We begin with a dose of one-half to one grain, and then give from two to four and one-half grains a day hypodermically, depending on the toleration of the patient. Usually from nine to twelve grains will bring about a cure, as far as we can state at present. We have had no relapses as yet, but we have used emetin for six months only. A large majority of our cases will take two grains a day, in doses of one grain morning and evening, without discomfort, and some have taken three to four and one-half grains per day, in doses of one to one and one-half grains three times a day. Perhaps so much of the drug is not needed, but until experience has shown that smaller doses will completely eliminate the infection, the larger doses, over a period of several days after the stools have formed, would *a priori* be the safest measure.

Also, until it has been shown that emetin alone will eliminate the infection for all time, I advise the simultaneous employment of bismuth subnitrate in large doses, because of the difference of action of the two drugs against the entamoebae. If there be any emetin-immune entamoebae resulting from the employment of the alkaloid, the bismuth subnitrate will effectually deal with them, and very possibly the latter drug will materially aid in the effectiveness of the emetin, just as mercury must also be employed with salvarsan in the successful treatment of syphilis, even though the action of bismuth is not that of a direct poison, as is the action of mercury.

References.

Darling, S. T. The Use of Bismuth Salts in Media to Detect the Formation of Sulphur Bodies of Bacterial Origin. American Journal of Public Health, Vol. 3, No. 3, 1912.

Deeks, W. E. Treatment of Dysentery Due to Infection with *Entamoeba histolytica*. Journal of the American Medical Association, Vol LX, pp. 38-42, January 4, 1913.

Deeks, W. E., and Shaw, W. Treatment of Amoebic Dysentery. Medical Record, New York, November 13, 1913.

Ehrlich. Chemotherapeutische Trypanosomen-Studien. Leipzig, 1909.

James, W. M. Clinical Identification of the Entamoebae. Proceedings of the Canal Zone Medical Association, Vol. 4, Part II, September to April, 1911-12.

Infection with *Entamoeba tetragena*. New York Medical Journal, April 5, 1913.

Notes on the Etiology of Relapse in Malarial Infections. Journal of Infectious Diseases, Chicago, Vol. XII, No. 3, May, 1913.

Digitized by Google

Rogers, L. The Rapid Cure of Amoebic Dysentery and Hepatitis by Hypodermic Injections of the Soluble Salts of Emetine. British Medical Journal, No. 2686, June 22, 1912.

Further Experience of the Specific Action in Amoebic Disease of Hypodermic Injections of the Soluble Salts of Emetine. British Medical Journal, No. 2695, August 24, 1912.

Wynne, C. M. The Therapeutic Effect of Salvarsan in the Treatment of Amoebic Dysentery and Amoebiasis: Report of Twelve Cases: A Preliminary Note. Proceedings of the Canal Zone Medical Association, Vol. V, Part I, April to September, 1913.

Digitized by Google

THE WAY TO VACCINATE.*

ISADORE DYER, Ph. B., M. D.,
Professor of Diseases of the Skin, Tulane University of Louisiana.

The discussion of a subject like vaccination may seem trite, but every day the revision of accepted doctrines is undertaken and the result sometimes proves worth while.

The theories attaching to vaccination have never been entirely reduced to any single belief and the bacteriologists yet work for the element in the viruses of the variolous diseases which is responsible for the contagium and for the processes of the variety of symptoms complex found in the different modifications of what is believed to have been an original source.

The principal deduction rests in the acceptance of a demonstrated fact that the inoculation of a subject with vaccinia modifies or prevents smallpox in so large a proportion of instances as to make vaccination an almost certain preventive of smallpox.

Until we know the *causa morbi* in smallpox, chickenpox and vaccinia, we may speculate as to the relation of these diseases and their manifestations.

Jenner began, in 1768, to establish the protective advantages of vaccinia inoculation, and succeeded so well that until the present time his views have carried in all parts of the world, the only progress in vaccination having been along the lines of the material used to effect the procedure.

It is not known how long before Jenner some method was employed to prevent the spread of smallpox, for both in China and India variolization was practised in the earliest recorded times. It has even been established that the repeated inoculation of variola through succeeding generations of bovines has resulted in a vacciniform eruption, acting as vaccinia when used on the human subject.

Vaccinia, however, seems to have no immunizing quality against varicella, for experiment repeatedly has shown that

*Received for publication November 8, 1913.

Digitized by Google

vaccination may be readily completed immediately after an attack of chickenpox.

The correlation of smallpox and vaccinia, though, is complete, for not only does vaccination protect against smallpox, but subjects recovered from smallpox do not accept vaccinia. More than this, an attack of chickenpox gives no protection against smallpox. Some years ago the writer reported an instance of a case of varicella which was wrongly incarcerated for smallpox and which contracted smallpox while in the pesthouse and subseqeuntly died of virulent confluent smallpox.

Vaccinia, then, prevents or modifies smallpox, and is a desirable procedure in protective medicine. Its usefulness has reached a point beyond mere desirability, and in some countries the practice of vaccination has become a hygienic measure enforced by law. In Germany, for example, vaccination has become so well established that smallpox is almost excluded among the infectious diseases.

Where the police power of health authorities is less than in Germany, opposition to vaccination has prevented its universal practice, and the result has been that smallpox still prevails, in certain countries, as a frequent local epidemic.

The general education of the public is gradually overcoming prejudice, however, and in time all children will be vaccinated early, rather than under health regulations at the school age, as at present.

More than mere prejudice has occasioned the objection to vaccination. The procedure has been surrounded with certain practices which have carried unnecessary dangers.

Formerly vaccination was conducted with scabs and virus taken from human subjects, often without any care as to the source of the vaccine. All kinds of infection resulted, even syphilis and leprosy being in the list. Even when bovine vaccin was used, its derivation was uncertain and the foulest sort of sources afforded material for the procedure, with the result that a long list of sequels made vaccination a dreaded experience.

Even recently the expectation of disagreeable symptoms from vaccination was presented to the subject and in the symptoma-

Digitized by Google

tology of vaccination are related certain phenomena that are undoubtedly rather the result of the vaccination than of the vaccinia.

At best the vaccin material is open to criticism for its impurities and even under present regulations the preparation of commercial vaccin does not preclude the possibility of bacterial infection outside of vaccinia inoculation. The vaccin is now derived from cattle, usually heifers, kept as clean as possible, and the lymph is taken from clear vesicles, before clouding takes place. Such lymph is either collected on bone points, dried and placed in sterile tubes, or the lymph is held suspended in glycerin and placed in aseptic receptacles. The glycerin is employed for the purpose of preventing bacterial growth in the vaccinia solution, while it is the accepted vehicle for carrying the vaccin, as it is not antiseptic enough to destroy the virus of the vaccin.

This brings us to the main title of this paper, "The Way to Vaccinate."

The common practice in vaccinating is to excoriate a small area of the skin until the lymph flows, then to rub in the virus, allow it to dry, and protect the wound with some dressing, usually a shield of transparent celluloid, with perforations for air space. The operation itself is commonly performed with a lancet, bone point, scarifier, or drill (like that of Von Pirquet).

Some operators are aseptic in their technic, cleaning the area to be vaccinated, by washing, sponging with alcohol, and the instruments are sterile.

Most operators, however, once the operation is performed, leave the rest to the individual who has been vaccinated. The accepted process of vaccination allows a certain period for the virus to "take," varying from three to ten days. The vesicle forms within five or six days as a rule, and then the disagreeable symptoms set in, intense itching (often satisfied by scratching), rigors, elevation of temperature, malaise, with a very marked local reaction. This is evidenced by a red areola about the vesicle, or vesicles; swelling, which may be extensive; pain of circumscribed type. The vesicle clouds, and in two or three days turns yellow, or may become hemorrhagic, and in about

Digitized by Google

ten to fourteen days crusts. Usually the crust forms on a pustular area, somewhat larger than the original vesicle. When the crust falls the first time, there is usually an angry, pouting, superficial ulcer, which gradually heals with a pit, or pock mark, deemed the evidence of a successful vaccination.

Now, the writer desires to submit that this whole process is wrong in principle; that a procedure aimed at a hygienic precaution should carry with it as little hardship and discomfort as possible; that if the clinical history of the variolous group is studied, there is no need for a series of disturbances in vaccination which can easily be prevented if a method is followed which will discount the evils of vaccination. When the papular eruption of smallpox appears, there is no hesitancy in pronouncing the disease. It is *smallpox.* As soon as the papule is transformed into a vesicle, the attending physician does everything in his power to prevent pustulation and the consequent pitting. The skill in the treatment of smallpox is largely measured by the ability to prevent pitting, and pitting can hardly be prevented unless the local infection with pus organisms is forestalled.

In chickenpox, *the usual eruption stops at a vesicle,* which by intelligent practitioners is freely opened and the *site of the vesicle dressed with antiseptics to prevent pustulation.*

Why, then, should the vaccinia lesion be allowed to go further than the vesicle? Why should a pustule be *necessary* for vaccination, if it is not necessary for smallpox or for varicella?

Vaccinia is a disease of rather certain incubation period. When the vesicle forms at the site of the inoculation the person inoculated with the virus has vaccinia, just as much as the individual with a chancre has syphilis.

The vaccination ought to stop at the vesicle.

If this is not true, then why is it that extraordinary precautions are used in securing bovine vaccin lymph, to make sure that the vesicles are broken and the lymph removed *before the content of the vesicle becomes cloudy?* If vaccinia in the heifer is complete enough to be reinoculable from the lymph in a clear vesicle, is it not logical to conclude that vaccinia is complete in the human subject at the same stage?

Digitized by Google

We propose that the vaccination process should stop at the vesicle and in order to make sure of this, the physician should see to it that the eruption stops with the vesicle, by purposefully breaking the vesicle and treating the site antiseptically.

This practice the writer has followed for nearly twenty years, with a happy satisfaction in the knowledge that the proverbial "sore arm" is prevented and that the scar of vaccinia is either avoided, or is reduced to a minimum.

The way to vaccinate, then, should be based upon the following technic:

1. Clean the area thoroughly with soap and water; follow with alcohol sponging. Be sure the alcohol dries off well, so as to leave the area aseptic but not antiseptic.

2. Vaccinate by any aseptic method; the writer usually employs the point coming with the glycerinized vaccin and the area is scarified.

3. Cover the area of vaccination at once with sterile cotton and hold in place with collodion. A shield may be used over this dressing to prevent its removal.

4. Conduct the vaccination as you would any other surgical case. Have the patient return on the third, fifth, and seventh days. If there are no symptoms of itching, or of pain, do not remove the dressing until the fifth or seventh day. On the day the dressing is removed, if there is no sign of vesiculation, reapply sterile dressing as before. On the seventh day, look again for the vesicles; if none, repeat dressing. Do this every two days until the tenth or twelfth day. If no vesicles show, revaccinate and proceed as before.

5. If the vesicle shows at any dressing, brush the surface with tincture of iodine, or with pure alcohol, then carefully clip the top off of the vesicle with a pair of sterile scissors. Paint the base of the vesicle with a thirty grain to the ounce solution of nitrate of silver, or with pure carbolic acid (followed with alcohol). Put on a sterile dressing, or an antiseptic dressing. Change the dressing every two days.

At the end of four or six days, there is a dry crust (*not pustulating*). Now the patient can take care of the wound, with

Digitized by Google

a dressing of ichthyol (20 grains), phenol (10 grains) ointment (oxide of zinc ointment, 1 ounce), changed night and morning.

The evils of vaccination, particularly those incidental conditions following the pustulating arm, are prevented by such a procedure. There can be no impetigos, and multiforme erythema and its congeners cannot result from pus absorbtion.

One point more for reflection, while discussing vaccination: If vaccinating protects against smallpox, the more complete the vaccination the more complete should be the protection. Vaccination is presumptively protective for seven years. Would it not be better to make sure of complete vaccination by repeatedly vaccinating a successful vaccinee until the vaccin no longer takes? In other words, if a vesicle forms, vaccinate again, at once, and continue vaccinating as long as a vesicle forms until the person is completely immunized *against vaccinia!*

Digitized by Google

NOTES ON CESTODE MONSTROSITIES.

With a Report of a New Case of Taenia saginata with Y-shaped Proglottides.*

HUGH McCULLOCH, M. D.,
Assistant in Medicine, Washington University.

Abnormalities in segments of cestodes occur rather frequently, probably more so than one might suspect from a survey of the literature. The more common of these abnormalities consist of defective or unusual formation of the segments, unusual locations of the genital pores or the genital apparatus, or a marked asymmetry in the branching of the uterus. Abnormalities have also been noted where the line of division between segments on one side of the worm does not coincide with the same line on the opposite side.[1] Examples of rudimentary segments, found on one lateral border and which do not extend all the way to the other side, have been noted. Again, the line of division between segments beginning on one lateral border may stop before reaching the other border.

Abnormalities which involve the structure of the whole worm have not been reported as occurring so frequently. The greater number of these abnormalities have been in *T. saginata,* and of these, the most common form is that described as a three-cornered or prismatic malformation of the segments. Thirty-six examples of these three-cornered cestodes have been reported. Vigener,[2] who reports one specimen, reviews the data of all the specimens that had been reported before 1904, a total of thirty-five. MacCallum[3] reported the first specimen on this continent. Of the total thirty-six specimens, twenty-two have been

*Read at the Tenth Annual Meeting of the American Society of Tropical Medicine, held in Washington, D. C., May 6, 7, and 8, 1913.

From the Department of Internal Medicine, Washington University, and the Medical Service of the Washington University Hospital.

Specimen presented by Dr. George Dock before the American Society of Tropical Medicine and the Association of American Physicians at Washington, D. C., May, 1913.

Digitized by Google

T. saginata. Two of these are not described with sufficient exactness to make their classification certain. In four more the differentiation between *T. saginata* and *T. solium* is not only conclusive and the classification of these specimens can be only approximate. Three specimens of *T. solium,* one specimen each of *T. crassicollis, T. echinococcus, Dipylidium caninum, Anocephala perfoliata, Cysticercus inermis, Cysticercus pisiformis;* three specimens of *T. coenurus;* two specimens each of *Cysticercus coenurus* and *Cysticercus cellulosa,* have been reported. Several specimens occurring in *Cysticercus tenuicollis, Cysticercus cerebralis* and *Cysticercus serialis* have been described. The first specimen was reported by Andry in 1741. Bremser recorded the first drawing. Scolices of this form of *T. saginata* were recovered and described by Trabut, Küchel, Néveu-Lemaire, Jelden and Vigener.

The host of the parasite described in this report is S. B., No. 8171, a negress, age 20, who entered this hospital on the Medical Service November 24, 1912. She had noticed for two years that she was passing pieces of tape worm. She had lived, up to two years ago, in various inland parishes of Louisiana. During the past two years she has lived in St. Louis. So far as she knows, none of her associates has been similarly infected, and the nature of her diet does not reveal the possible source of infection. The patient presented no subjective symptoms or physical signs of importance except an eosinophilia of 5 per cent.

The parasite appears as though two *T. saginata* had been placed with their flat surfaces together and the two fused along one of their adjacent borders, resembling roughly two leaves in a closed book. The parasite can be unfolded without difficulty throughout its whole length. The scolex has not been recovered. The length of the specimen was approximately 250 centimeters and numbered about 700 segments. The narrowest segment is two millimeters, the widest twenty-two millimeters, the thickness from one to two millimeters. The cross section of a segment is Y-shaped, the perpendicular limb or crest being much shorter than the other two limbs. (Fig. 2.) The two lateral limbs are about equal in length and thickness. Without exception, the genital pores are located on the crest and about

Digitized by Google

midway between the furrows dividing the segments. The transition from the unripe to the ripe segments is gradual and the unripe segments bear the same relation to the ripe ones as regards length, breadth and appearance of the sex organs as exists in the normal parasite. Apparently, only one abnormality has been found in the mature portions of the parasite which does not occur in the immature portions; namely, the preesnce of fenestrations along the crest. The ripe segment is more irregular in shape, there being a tendency for curling to take place along the border; no more, however, than is found normally. Throughout the whole length of the parasite, with a few exceptions mentioned below, the segments on one side of the crest are joined laterally and symmetrically with a segment of the same period of development on the other side. The dorsal and ventral furrows between the two consecutive segments coincide one with the other.

Histological study of normal *T. saginata*, at the present time, is not developed to a final stage and still leaves us much in the dark concerning the relations and functions of many structures that are present. Much remains to be said on the subject, and especially is this true of the sexual apparatus. Following the descriptions of Leuckart,[4] Cobbold[5] and Blanchard,[6] the parasite under consideration shows a structure varying only slightly from normal. Microscopical examination of serial sections of segments does not reveal any structure in the crest which could be taken for a line of division or fusion, if this be the mode of formation of the parasite. Excretory canals are present in each limb and crest, running parallel with and close to the free border and continuous from one segment to the other. A canal also runs across the segment close to the furrow dividing one segment from another, and at only one end. They do not appear in any way abnormal. Calcerous corpuscles are present in the body of the segment in normal numbers and appearance. The sexual apparatus is distributed equally to both limbs. Of the male elements, the vas deferens can be seen as a long convoluted cord, enclosed in a sac, folded on itself and divided into two parts as it extends backwards into the two limbs, chiefly to the dorsal side of the medullary layer. The

Digitized by Google

vasa unite and terminate in a single penis which is retracted within the cirrhus bulb. The cirrhus bulb, as well as the sac which encloses the penis and vasa, is surrounded by a thin layer of muscle fibre. The bulb opens by a narrow orifice on the top or side of a small elevation or mound-like projection on the floor of the genital pore. The genital pore is cup-shaped. Of the female elements, the yolk sac was not recognized in the sections. The main stem of the uterus is single and lies in the axis of the segment from which the two wings extend. The main stem gives off branches radiating into the crest and two limbs. The oviduct opens into the bottom of the genital pore through a single orifice. It extends backward as a single straight tube and after a short distance divides into two parts of equal size and appearance. The two parts then pass into the two wings and terminate in a bulbous enlargement about the middle of the segment. This bulbous enlargement is crescent shaped in longitudinal sections and lies on the ventral side of the medullary layer. Each one contains a mass of tissue, made out by serial sections to be hemispherical in shape and consisting of a loose network of fibres with many elongated nuclei. The ovaries lie in close proximity to these bulbous enlargements. One is present in each wing. No connection can be seen between them and the oviduct, though there is a connection through a small canal with the main stem of the uterus. There is no branching of the ovaries as has been described. The external orifice of the oviduct is narrow, about four to five micra, and is encircled by a thick ring of muscular fibres. This layer of muscle fibre looks as though it might perform the function of a sphincter. Just back of this muscle fibre ring, the oviduct sharply expands into a bulbous enlargement with a diameter about four times as great as that of the orifice, the muscle fibre layer surrounding it at the same place becoming thinner. The oviduct continues backward and gradually becomes narrower until it opens into the bulbous enlargement described above.

In the specimen consisting of 700 segments there are forty-five which are not symmetrical. This asymmetry consists of two or more segments on one side of the crest being opposite one or more segments on the other side. Two segments on one

Digitized by Google

side opposite one on the other were found thirty-nine times. (Fig. 1a.) Three on one side opposite one on the other, three times. (Fig. 1b.) Four on one side opposite one, on only one occasion. Of the total number of asymmetrical segments, the multiple division occurs on the right side about as frequently as on the left. In a few instances, segments opposite each other were found which showed very deficient development, being only about one-third as long as the succeeding segment, but about the same width. (Fig. 1d.) These segments are symmetrical and resemble those that have been called supernumerary ones by other authors. They were found only in the immature portions of the specimen.

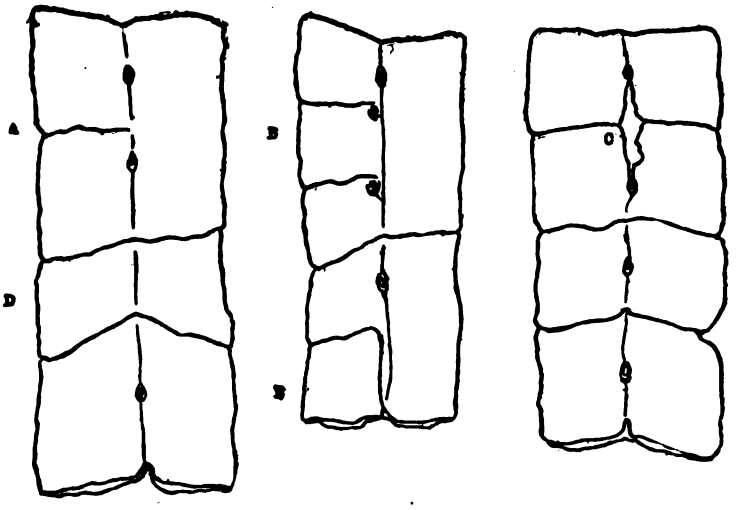


FIGURE 1.

DIAGRAMS OF ABNORMALITIES IN THE SEGMENTS OF THIS SPECIMEN.

(a) Example of two segments on one side of the crest opposite one on the other.
(b) Example of three segments one side opposite one.
(c) Example of fenestration along the crest.
(d) Example of a supernumerary segment without genital pore.
(e) Example of segment isolated from the opposite side.

In the asymmetrical segments, it appears as though the multiple ones on the same side are completely divided, that is, the furrow forming the line of division extends from the outer border of that limb to the top of the crest, where it stops. The

Digitized by Google

segment then is not divided from the one that is opposite. In three instances, however, where two segments on one side are opposite one on the other, the furrow does isolate one of the segments from one on the other side. (Fig. 1e.) That is, the furrow runs up to the crest, then turns and runs parallel with it to the line of division from the next segment. In these segments where the isolation is apparently complete, no genital pore can be seen.

In the parasite, the genital pores open without exception on the dorsal surface of the crest and not in any instance on either lateral free border. Among the descriptions reviewed by Vigener,[2] the genital pores have been reported most frequently on all three borders, though a larger number of pores open on either one free border or the other, and usually on the crest. He also mentions specimens in which the pores have been observed on only one border. Each symmetrical double segment possesses a single genital pore, a part of the generative system in each limb. In the asymmetrical segments, one genital pore connects with a single segment on one limb and with one of the series on the asymmetrical limb, in each instance, this segment being the first or the last of the series. For each one of the other segments on the asymmetrical limb, there exists a separate single, never double, genital pore not communicating with any other segment. This genital pore is invariably situated a little to the side of the crest on which the segment lies and in one of the corners, never in the middle. (Fig. 1b.)

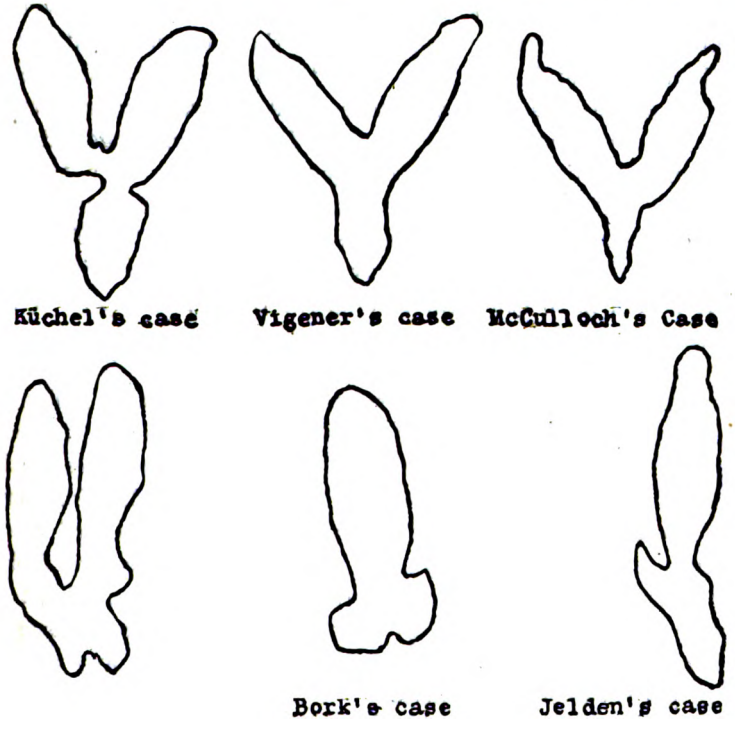
The fenestrations were found along the crest in the mature portions of the parasite and usually involving two consecutive segments. (Fig. 1c.) In none of the segments examined does the fenestration extend farther than the genital pore. This last fact makes it evident also that the fenestration does not involve a whole segment or three consecutive ones. In no instance could a fenestration be found in the body of the segment itself nor in the furrow between succeeding segments. In Vigener's specimen the parasite toward the mature end was bifurcated for some little distance (fifty segments), the line of division occurring along the crest.

Ova were present in the feces of the patient in no more or

Digitized by Google

less numbers than are usually found in infections with *T. saginata*. The dimensions were the same as of the ova of normal parasites, and as well as could be made out there was nothing abnormal in the characteristics of the individual ovum. Vigener mentions a specimen in which there were an increased number of hooklets in the ovum.

The scolex of this parasite has not been recovered. The scolices of the three-cornered taeniae that have been described, possessed six suckers instead of four. One specimen possessed only four suckers, another had five normal suckers and one imperfectly formed. The six suckers were grouped in three pairs and so placed that each pair was on the line of one of the free borders of the parasite. No rostrum was present. The segments arose directly from the scolices without the interposition of a neck. The specimens of cysticercus which have been described have all shown six suckers. Three attempts have been



Digitized by Google

made to obtain the scolex of the parasite herein described, using preparations of male fern that in other cases of normal parasites were effective. The patient is still passing abnormal segments of the same description. It is a noteworthy fact that so few scolices have been recovered from a relatively large number of specimens.

Specimens have been reported in which the crest is absent, giving the cross section of a segment the outline of a V instead of a Y. Other specimens show one of the limbs as a rudimentary ridge along the whole length of the parasite, and in the cross section, this limb is represented by a small protuberance.

There can be no doubt that the formation of these unusual parasites goes back to the anlage of the cysticercus stage. The cause of the formation has not been explained. It has been suggested that they belong to a separate species of taenia and various names are given to such a species as *T. lophosoma, T. triedre, T. prismatique,* etc. If such be the case, it is evident that feeding experiments should show these unusual features to be hereditary and each ovum from the parasites should develop into a cysticercus with six suckers. At present no results of such an experiment can be offered. It has been suggested that the malformation exists as a degenerative form of a true *T. saginata.* The appearance of the parasite in gross suggests a fusion of two parasites, otherwise normal. In the Y-shaped parasites, three normal ones may have entered into this fusion. This fusion is so complete throughout the whole length of the parasite that it might be inferred that the fusion took place in the closely approximated anlage of two scolices. There is no remnant of structure in the segments that suggests a line of fusion. The fenestrations and bifurcations in the mature portions of the parasite might suggest a fusion of parasites as the mode of formation with subsequent weakening and division along the line of fusion. Against this we have an example of fenestration occurring in the segments, *T. fenestrata,* where no fusion could have taken place. The malformation may result from an abnormality in the anlage of a single scolex and by reason of this abnormality, six suckers are formed, devoid of any process of fusion between two scolices.

Digitized by Google

Literature.

1. Child, C. M. Biological Bulletin. Vol. I, August and September, 1900, pp. 215-250, 261-290. Vol. III, July and August, 1902, pp. 95-115, 143-161.

2. Vigener, J. Jahrbucher des Nassau. Vereins f. Naturkunde. Jahrgang LVI. 1903.

(This article furnishes a bibliography of all the specimens mentioned.)

Zeitschrift f. Fleisch und Milchhygiene. Band XIV, 1904, pp. 106-109.

3. MacCallum, G. A. Medical Record, Vol. XXCIII, March, 1912.

4. Leuckart, R. Die parasiten des Menschen und die von ihnen herruhrenden Krankheiten. Erste Band. Erste Abteilung. Zweite Auflage. Liepzig. 1879-1886.

5. Cobbold, T. Sp. Parasites, a Treatise on the Entozoa of Man and Animals. London, 1879.

6. Blanchard, R. Traite du Zoologie Medicale. Tome Premiere. Paris, 1889.

Discussion.

Dr. Creighton Wellman, New Orleans: In studying insects numerous variations of form are frequently met with. There is a case on record in which an earthworm exhibited the same anomaly as that shown by the tapeworm which Dr. Dock has just demonstrated.

Dr. P. E. Garrison, New York City: Has the study of the anatomy of this parasite gone far enough to enable Dr. Dock to describe the excretory canals, the number of stems to the uterus, and the number of nerve trunks?

Dr. Dock: These questions have not yet been investigated, but we hope that they will be cleared up.

Digitized by Google

HYGIENE IN THE PHILIPPINE SCHOOLS.*

ALLAN J. McLAUGHLIN,
Surgeon U. S. Public Health Service.

Practical hygiene is taught in the Philippine schools even in the lower grades. In this country we are prone to overlook the enormous influence of school children upon the hygiene of the home. The children of poor, ill-educated parents are often the intermediary through which the simple gospel of hygiene and disease prevention reaches the parents. In the Philippines this is even more true, and in many instances it is only because of the children that the parents carry out the instructions of the health officer.

In combating cholera we were not slow to take advantage of the schools. A cholera circular containing the simple facts of the spread and prevention of cholera was used as a catechism even in the elementary grades. The children recited the answers daily, and in times of actual epidemic this teaching took precedence over all other studies and was supplemented by actual demonstration of hand cleansing and disinfection.

With an epidemic of contagious disease existing, there is a tendency in most communities to close the schools. In the Philippines, on the contrary, it is the policy of the Bureau of Health to keep the schools open because of their extraordinary value in teaching the precepts of disease prevention. They were used in cholera epidemics as demonstrating stations where the children were taught how to protect themselves and their parents against cholera. The same principle is used in combating tuberculosis, hookworm, dysentery, and beri-beri. The children are taught how these diseases are contracted and how they may be prevented.

The modern Philippine school building is a model of construction, adapted to the Tropics. There is no heating problem in the Philippines, and as a consequence ventilation is very much simplified. Water supply and sewage disposal are directly un-

*Received for publication November 30, 1913.

Digitized by Google

der the control of the Bureau of Health. The pupils are specially trained in the necessity of thorough hand cleansing after using the toilet and before eating. The children have been used also to eliminate the time-honored Philippine custom of eating with the fingers out of one common family dish.

The dense ignorance of sanitary principles and the Oriental fatalism of the older generation could not be successfully combated without the aid of the school children. With their aid a very great improvement has been effected.

There is now in Manila a very efficient medical inspection of schools. This is particularly effective because of the splendid facilities of the Bureau of Health for giving medical treatment. The city is divided into health districts with free dispensaries and hospitals where the school children are treated. In this country the health department can often do no more than recommend treatment. In Manila the child is reported to the Bureau of Health and the powers and organization are such that control is easily maintained until the child is returned to school, cured. Special attention is paid to the teeth of children and these are treated in the free dental clinics of the Philippines General Hospital. During the school year ended March 29, 1912, in Manila over 2400 children were referred to the hospitals and dispensaries of the Bureau of Health for treatment.

The effect of the teaching and practice of hygiene in the Philippine schools is not only manifest in the improved physical condition of the pupils, but is a powerful instrument in the sanitary regeneration of the entire nation.

Digitized by Google

THE LIFE-HISTORY OF DERMATOBIA HOMINIS.*

FREDERICK KNAB,
Bureau of Entomology, U. S. Department of Agriculture.

The larva of this fly is a common parasite of man, as well as of other animals, wild and domestic, in the American Tropics. These larvae live singly beneath the skin and cause considerable inconvenience. Indeed, when present with man in some numbers, as sometimes happens, they may cause serious illness. In fact, cases frequently present themselves to physicians, and one finds abundant accounts of them in medical literature.

The larva occupies a tumorous swelling, which may be situated on almost any part of the body; from the center of this there is a small orifice through which the larva, by means of the spiracles terminating the attenuated posterior portion of its body, obtains the necessary air. From this orifice more or less pus is discharged and through it the larva, if left undisturbed, finally escapes to the ground to complete its metamorphosis. It is not my purpose to present in detail the better known portion of this insect's life-history. For this the reader is referred to the classical papers of Raphaël Blanchard[1] and of Henry B. Ward.[2] However, a word of caution must be given regarding the numerous papers on the subject, many of which contain misstatements, and some of them, indeed, deal with very different species of flies from the one indicated.

The object of this paper is to discuss some recently published observations which throw an interesting light on the manner—hitherto entirely unknown—in which the fly disposes of her offspring. Until quite recently nothing exact was known of the manner in which infestation takes place and it has been commonly assumed that the eggs or very young larvae were placed directly upon or beneath the skin of the host by the female fly. Indeed, one finds frequent statements that the fly "stings" during the act of oviposition; but these are controverted by the fact that the fly has no offensive weapons at either the oral or

*Received for publication December 9, 1913.

Digitized by Google

the anal end. It was already indicated by analogy that the infestation does not occur in such direct manner and the writer believed that he had good support for the latter view in the large number of eggs produced by a single female. Neiva has shown, by dissections, that the number of eggs of a single female *Dermatobia* ranges between 750 and 800.[3] Recently Prof. J. Surcouf of Paris has produced evidence that the infestation with *Dermatobia* larvae is actually brought about by mosquitoes.[4]

In fact, the belief that the larvae of *Dermatobia* are acquired through the sting of a mosquito has long existed among the natives in certain regions. As early as 1749 De La Condamine reported it as the prevalent belief among the natives of Cayenne. In Venezuela the larva of *Dermatobia* is commonly called "gusano de zancudo," and in Guiana we have the corresponding "mosquito worm." The writer, while on the Isthmus of Tehuantepec, in 1905, found this idea warmly defended by the natives, and certain large mosquitoes (*Psorophora*) were pointed out to him as the "madre del gusano" (mother of the worm). Naturally this prevalent belief has been looked upon by investigators with incredulity and classed by them with other popular superstitions; consequently we find but rare mention of it in literature. The evidence now presented by Prof. Surcouf is as follows:

Prof. Surcouf has received from Dr. Gonzalez Rincones of Caracas specimens of the mosquito *Janthinosoma lutzii,* with clusters of proportionately large eggs attached, and from these eggs he obtained what are undoubtedly the young larvae of *Dermatobia.* He points out that already in 1900 Prof. Raphaël Blanchard had observed such eggs on the bodies of certain mosquitoes received from Central America. Furthermore, in 1910, Dr. Morales of Costa Rica had declared that *Dermatobia* oviposits directly upon the body of a mosquito, and that the latter, by phoresy, conveys the eggs or larvae to the vertebrate while sucking its blood. He also states that in 1912 Dr. Nunez Tovar of Maturin (Venezuela) observed mosquitoes carrying such eggs and by causing them to bite animals obtained tumors, which, at the end of eleven days, were found to contain typical *Dermatobia* larvae; from these latter he reared the adult fly. Surcouf gives a

Digitized by Google

figure of one of the specimens sent to him, showing the *Janthinosoma* with the *Dermatobia* eggs *in situ*. The eggs appear to be about sixteen in number; they form an irregular package and are attached to the basal third of the abdomen. They appear to be attached to the ventral surface and to one side and they stand out from the body, the micropylar end free and pointing downward.

To the data presented by Prof. Surcouf may be added still another observation, recently communicated to me by Prof. F. W. Urich of Trinidad. In 1905 he also found *Janthinosoma* with eggs attached in the manner described by Surcouf and presumably identical. These mosquitoes he sent to the Bureau of Entomology in Washington at the time. No satisfactory explanation was offered, nor was their significance suspected. Unfortunately the specimens cannot now be found.

It appears, then, from these observations, that the eggs of the *Dermatobia* hatch and the larvae find their way to the host while the mosquito is sucking blood. The evidence of a number of independent observers, and, above all, the mosquitoes received by Professors Blanchard and Surcouf with the undoubted eggs of *Dermatobia* attached, point to this as the mode of infestation. But the manner in which the eggs get upon the mosquito is still uncertain, as we have contradicting assertions. Above is quoted the declaration of Dr. Morales of Costa Rica, that the eggs are fastened to the mosquito by the fly herself. Dr. Gonzalez Rincones has another explanation and this is accepted by Prof. Surcouf. Their assertion is that the eggs of *Dermatobia*, along with a viscous substance, are laid upon foliage in moist localities frequented by *Janthinosoma*. The eggs, as found on the mosquito, are cemented to her and to each other by a strongly adherent cement. This cementing substance, these authors state, softens and again becomes viscous when moistened. From the data furnished him by Dr. Gonzalez Rincones, Prof. Surcouf concludes that the eggs become accidentally attached to the mosquitoes while these promenade over the leaves. Those that adhere to the abdomen remain fastened, the thorax is protected by the coxae and femora, and those that stick to the legs or wings are detached when the insect moves about.

Digitized by Google

There are a number of strong reasons why the explanation of Drs. Surcouf and Gonzalez Rincones cannot be accepted. First, the eggs are found attached to a part of the mosquito's body which does not come in contact with the leaf surface when she rests upon it; *Janthinosoma* rests with the body well elevated upon its long legs. Secondly, the eggs are attached in a definite way, by their bases and with the hatching end outward. This would hardly be the case if the eggs were picked up accidentally by the mosquito. Thirdly, were the eggs laid upon the surface of leaves, they would be much more likely to become attached to other insects, such as would not bring about their transfer to a suitable host. This last objection is strengthened by the fact that mosquitoes are not ambulatory insects, but on the contrary move about as little as possible when not on the wing.

The evidence, then, points rather to a definite instinct on the part of the mother *Dermatobia* to seek out the mosquito as the vector for her progeny. That the mosquito in every case observed has been a *Janthinosoma* is in itself significant, for these are perhaps the most bloodthirsty of all our American mosquitoes. It should be further noted that *Janthinosoma* is hardly separable generically from *Psorophora,* and, as already pointed out, the latter is believed by the natives of Tehauntepec to be the parent of the *Dermatobia* larva. The facts point very definitely to a complex and precise adjustment of the fly to the parasitic habit. The idea that the eggs of the fly are scattered by her promiscuously and picked up haphazard by other insects, it seems to the writer, must be rejected. On the other hand, the claim that the fly captures the mosquito and attaches the eggs to her needs verification. It is to be hoped that reliable observers will soon determine beyond doubt the facts in connection with what promises to be one of the most remarkable of the many strange inter-relations occurring in connection with parasitism.

Digitized by Google

References.

1. Blanchard, Raphaël. Sur les Œstrides américains dont la larve vit dans la peau de l'Homme. Ann. Soc. Ent. France, Vol. 61, pp. 109-154, Figs. 1892.

———— Contributions à l'étude des Diptères parasites. X, Encore sur les Dermatobies. Ann. Soc. Ent. France, 1896, pp. 641-652, pl. 17, Figs. 10-13.

2. Ward. Henry B. On the Development of *Dermatobia hominis*. Mark Anniversary Volume, pp. 483-512, pls. 35-36, 1903.

3. Neiva, Arthur. Algumas informaçoes sobre o Berne. Chacaras e Quintaes, Vol. 2, No. 1, pp. 3-7, Figs. 1910.

4. Surcouf, Jacques. La transmission du ver macaque par un moustique. C. R. hebd. Acad. Sci. Paris, Vol. 156, No. 18, pp. 1406-1408, Gigs. 1913.

(Abstract: Rev. Applied Ent., Ser. B, Vol. 1, No. 7, pp. 106-107. 1913.)

Digitized by Google

NEWS AND COMMENT

It is reported from Savannah, Georgia, that ten per cent of the people there are suffering from dengue.

Dr. Downey L. Harris has been appointed professor of hygiene and preventive medicine in the St. Louis University Medical School.

The fourth annual meeting of the American Association for the Study and Prevention of Infant Mortality was held in Washington, November 14-16.

Bubonic plague and yellow fever have both been reported as prevalent in Guayaquil. Great concern is felt by the health authorities of Ecuador.

Asiatic cholera is reported prevalent in Budapest and is spreading rapidly to Hungary. Of the 1,555 cases in the recent epidemic in Roumania, 661 were fatal.

A case of beri-beri was discovered on the British steamship *Strathmore*. The man, one of the Chinese crew, is now in the Quarantine Hospital of Marcus Hook, Pennsylvania.

Several sporadic cases of pellagra have appeared in the eastern part of Pennsylvania. Thirteen cases have been reported, which are the first recorded during the last decade.

Prof. Trautmann, department head of the Hygienic Institute of Hamburg, died on November 6. He has published many papers on meat poisoning, sterilization of milk, plague, etc.

There has been established in Ottawa, Canada, in connection with the Central Laboratory of Hygiene, an army medical school.

Digitized by Google

Courses for military medical officers will be given in army sanitation and laboratory work.

Surgeon-General Sir David Bruce, who has been chairman of the Commission of the Royal Society on Sleeping Sickness in Nyassaland, was a witness at Earl Desarts' committee appointed to investigate the transmission of trypanosome infection by flies and animals.

Sir Malcolm Morris of London, in a lecture on leprosy delivered November 19, surprised his audience by asserting that there are many lepers in London. There is no law in England to prevent the entrance of lepers into the country, but efforts are being made to provide a small institution for their care.

The fifth international meeting of physicians from Latin-American countries was held at Lima, Peru, the first two weeks in October. An interesting review of the history of medicine in Peru was published by the Cronica Medica. A special feature of the congress was the proof that a species of Leishmania is the cause of the uta of Peru.

At the first regular meeting for 1913-1914 of the Society of Tropical Medicine and Hygiene, held in London, October 17, Sir R. Havelock Charles, president, took as the subject of his presidential address "Neurasthenia and Its Bearing on the Decay of Northern Peoples in India." Twenty-three candidates were elected Fellows of the Society.

Under the new regulations adopted by the New York City Board of Health, only milk produced under the rules governing the sale of certified milk can be sold raw. All milk not meeting these requirements must be pasteurized. For the last four years, plans have been under way for the pasteurization of the entire milk supply of the general market of the City of New York, and these new rules are the final step in the accomplishment of this.

Digitized by Google

Dr. Randolph Tucker Shields, dean of the medical department of the University of Nanking, is in this country for the purpose of taking a course in the School of Tropical Medicine, Tulane University of Louisiana. The medical department of the University of Nanking gives a five-year medical course, there being twenty-eight students, eight of whom will graduate this year.

A new policy with regard to medical practice has been adopted in India. The important civil medical positions, formerly held only by officers of the medical corps of the Indian army, are now open to native practitioners. Serious objections are made to this by some, who point out the effect of this change upon European officials all over India, and the great objection of European women to native doctors.

Dr. Edwin Klebs, the distinguished pathologist and bacteriologist, died in Dartmouth, October 21. Klebs was a pioneer in the pathology of infectious diseases, and his work on diphtheria, typhoid, gunshot wounds and other bacteriological studies will always remain as classics. Probably his was the greatest influence in modifying the views of Virchow and teaching the medical profession the importance of infection as a cause of disease.

On November 18-20, the seventh annual meeting of the Southern Medical Association was held in Lexington, Ky., under the presidency of Dr. Frank A. Jones of Memphis, Tenn. The following officers were elected: Dr. Stuart McGuire, Richmond, Va., president; Dr. J. W. Jervey, Greenville, S. C., first vice president; Dr. F. H. Clarke, Lexington, Ky., second vice president; Dr. Seale Harris, Mobile, Ala., secretary and treasurer. The Association selected Richmond, Va., as the next meeting place.

Regulations governing maritime quarantine in the Canal Zone have been issued by Colonel Goethals, to go into effect with the opening of the Panama Canal. A bill of health must be filled out by the commander of each vessel, giving the description of the ship, source of food and water, sanitary history of of-

Digitized by Google

ficers, crew and passengers, sanitary condition of the cargo and sanitary condition of the ship. A certificate must be given that no one on board has been exposed for two weeks to or is ill of plague, leprosy, cholera, smallpox, yellow fever, or typhus fever.

A report has been issued by the Spartanburg, S. C., Board of Health, stating that more deaths are caused there by pellagra than by any other disease, even tuberculosis. Statistics show that 31 out of 340 deaths for the year were from this cause. Six hundred cases were reported in the county. The physicians from the U. S. Public Health Service, army and navy medical corps and New York Post-graduate Hospital, who have been studying pellagra there, expect to leave Spartanburg soon, as during the cold weather the epidemic subsides. They contemplate returning in the spring. The government is considering the erection of a $300,000 hospital at Spartanburg for the treatment of pellagra.

The Third Biennial Congress of the Far Eastern Association of Tropical Medicine was held in Saigon from November 8 to November 15, 1913. This international association has for its object to promote the study and practice of scientific tropical medicine in the Far East. The meeting was in charge of a scientific committee, who classified the sessions and communications of the congress into the following groups: 1. Protozoology and helminthology. 2. Cholera, plague, leprosy, tuberculosis. 3. Tropical fevers, malaria, beri-beri, dysentery. 4. Obstetrics and diseases of children. 5. Climate, hygiene, sanitary regulations. 6. Materia medica, pharmacology. 7. Veterinary medicine, epizootics. The languages of the association were English, French, or German. The president of the congress was Dr. Clarac, and the secretary, L. M. R. Montel. A large number of subjects were considered, including various aspects of amoebiasis, leprosy, beri-beri, intestinal parasites, tropical ulcers, ringworm, typhoid, cholera, cataract, plague, epidemiological studies, filariasis, goitre, diabetes, trachoma, hookworm, relapsing fever and malaria. The transactions of this association will constitute a substantial contribution to the science of tropical medicine and will be looked forward to with anticipation by all who are interested in the general subject.

Digitized by Google

CURRENT LITERATURE

A Note on the Leprosy of Rats in New Caledonia.—(Bull. Soc. Path. Exotique, 1913, VI, 484.) A. Leboeuf and Salomon have found rat leprosy in the rodents in New Caledonia, the lymphatic stage, the musculocutaneous stage, and the visceral stage all being represented. The first stage is the most common. John M. Swan.

Madura Foot with Involvement of Scarpa's Triangle and the Lower Part of the Abdominal Wall.—(Bull. Soc. Path. Exotique, 1913, vi, 485.) J. Arlo reports a case of madura foot with extension to the abdominal wall and groin, in a male, aged about 30 years. The diagnosis was made by finding the fungus in the whitish granules found in the pus.

J. M. S.

"Tamné," Human Myiasis of the Touareg of the Saharan Mountains Identical with "Thimni" of the Kabyles, due to Oestras ovis.—(Bull. Soc. Path. Exotique, 1913, VI, 487.) Edmond and Etinenné Sergent point out that the sheep bot fly infects the Touareg of the mountains and causes considerable inconvenience. It is the same disease as that called Thimini by the Kabyles. J. M. S.

A Note on the Transmission of Spirochaetes.—(Proceedings of the Society for Experimental Biology and Medicine, 1913, c, pp. 134-135.) J. L. Todd shows that the coxal fluid of ticks (*Ornithodoros moubata*) infected with *Spirochaeta duttoni*, even when free from anal excretion, contains spirochaetes. This observation will modify our ideas of the *modus operandi* of infection with African tick fever.

Creighton Wellman.

Biology of Tabanus Striatus Fabricius, the Horsefly of the Philippines.—(Philippine Journal of Science, Vol. VIII, No. 3, Sec. B, Tropical Medicine, June, 1913.) M. B. Mitzmain, in an important paper, works out the life history of *Tabanus striatus*, which species he has recently proven to transmit the parasite of surra. Each instar and stage is carefully and fully described and the article is thoroughly illustrated with seven full-page plates. C. W.

The Transmission of Cholera to Monkeys Through the Gastro-intestinal Tract.—Bull. Soc. Path Exotique, 1913, VI, 482.) H. Pottevin and H. Violle have succeeded in infecting four Synomologus monkeys with 18-hour cultures of *Spirillum cholerae* administered by stomach tube. All four animals died in from 12 to 48 hours and the lesions of cholera were demonstrated at autopsy. John M. Swan.

Digitized by Google

The Eruption of Variola and Vaccinia in the Monkey and the Buffalo.—(Bull. Soc. Path Exotique, 1913, VI, 488.) A. Gauducheau concludes that the virus of variola is the same as that of vaccinia; that it is filterable and invisible; that it is in symbiosis with a staphylococcus in vaccinia and with a streptococcus in variola. The evolution of the diseases, that is whether or not there is an exanthem, seems to depend upon the leucocytic reaction at the point of entrance of the virus.

J. M. S.

A Note on the Treatment of Amebic Dysentery by Emetin.—(Bull. Soc. Path. Exotique, 1913, VI, 491.) L. Gaide and P. Mouzels report four cases of amebic dysentery which were treated with emetin. The improvement was rapid; but at the end of the treatment all of the patients still had amoebae in their stools. This fact renders it impossible to say that the patients were cured. Two of the patients also presented a *Balantidium* infection. At the beginning of the treatment these organisms were not common, but their increased markedly during the treatment without influencing the intestinal symptoms. J. M. S.

Acute Pellagra or Dermatitis Exfoliativa?—(New York Medical Journal, Nov. 29, 1913, p. 1070.) W. H. Spurgin, who evidently is unacquainted with the most elementary aspects of his subject, discusses a case of supposed pellagra occurring in England. The two following quotations are illustrative of the complete ignorance of the author: "My theory is that this poor fellow may have drunk water from a shallow brook (great drought here all last summer) and either been bitten by the fly *or swallowed the ova, etc., of the Simulium.*" "But the bacteriologist *has not yet found the Simulidae or Culicidae, although urine, pus, and stools were examined.*" (The italics are ours.) It is remarkable that the Editor of so excellent a journal should allow such arrant nonsense to appear in its pages. Creighton Wellman.

The Transmission of Verruga by Phlebotomus.—(Jour. A. M. A., Vol. LXI, No. 19, November 8, 1913, pp. 1717-1718.) Charles H. T. Townsend reports the successful transmission of Varruga Peruviana by means of *Phlebotomus verrucarum* (Townsend). The animals used were hairless dogs belonging to the species *Canis caraibicus* (Lesson), which were in perfect health at the beginning of the experiment. The bodies of twenty females, unfed previously to the experiment, were triturated and introduced hypodermically in 1 c. c. of "an artificial serum." Six days afterwards symptoms developed, and blood examination later showed numerous bodies resembling the *Leishmania*, but decidedly not that organism, on account of the absence of the kinetonucleus. The author firmly believes that verruga is transmitted by *Phlebotomus*, having done considerable work in this field, following entomologic lines alone, and it will add greatly to our knowledge of this obscure malady in the future.

P. L. Querens.

Digitized by Google

The Biology of Some North American Ticks of the Genus Dermacentor.—(Parasitology, Vol. VI, No. 2, July 16, 1913.) F. C. Bishop and H. P. Wood state that six of the eight American species of this genus are of more or less economic importance, being pests of man and domestic animals, and one, *venustus*, the carrier of Rocky Mountain spotted fever. Three species (*nitens*, *albipictus*, and *nigrolineatus*) remain on the host during the moulting period; the others drop to the ground between each feeding stage. Detailed biological notes are given on three species, *albipictus*, *hunteri*, and *nigrolineatus*. *Hunteri* has been found only on mountain sheep at altitudes between 1500 and 2500 feet. *Albipictus* is commonly found attached to horses, cattle, elk, moose and mountain goats. Horses frequently have severe infestations. The feeding period of this tick is limited to late fall, winter, and early spring. The distribution has been quite thoroughly worked out and is graphically shown in the article. W. V. King.

Galyl in Trypanosomiasis.—(Bull. Soc. Path. Exotique, 1913, VI, 502.) Laveran and Roudsky have found galyl very active in infections with *Trypanosoma brucei*, *Trypanosoma evansi*, *Trypanosoma rhodesiense*, *Trypanosoma soudanense*, *Trypanosoma hippicum*, and *Trypanosoma gambiense*. It is inactive in infections produced by *Trypanosoma dimorphan*, *Trypanosoma congolense*, and *Trypanosoma pecorum*. Ludyl is also inefficacious in infections with *Trypanosoma dimorphon*. It is known that the activity of a medicament often varies from one species of trypanosoma to another; but it is exceptional that the separation into sensible trypanosomes is as clear as it is here. The fact that galyl acts neither upon *Trypanosoma dimorphon*, *Trypanosoma congolense*, nor *Trypanosoma pecorum* shows that these organisms are related (*voisins*). From the practical viewpoint it is important to know that galyl cannot be used in all trypanosome infections. John M. Swan.

The Apparent Identy of Agchylostoma ceylanicum (Looss, 1911), and Agchylostoma braziliense (Faria, 1910).—(Journal of Tropical Medicine and Hygiene, Vol. XVI, No. 21, November, 1913, pp. 334-335.) Robert T. Leiper comes to the conclusion that the *Agchylostoma ceylanicum* found by Lane in the dogs and cats of Bengal, and in three of thirty stools secured from prisoners of the Mymensing jail, is not a new species, but is identical with the *Agchylostoma braziliense* described by Faria as infesting the cats in Brazil. It can easily be differentiated from *A. duodenale*, *A. canicum*, by "the aborescent disposition of the cement gland in the male genital organs." This species is not present among those of the cats and dogs of Africa. The author suggests that the generic name *Ancylostoma* be used, as the spellings Agchylostome, agchylostomiasis, ankylostome and ankylostomiasis are not authoritative and can be considered pedantic.

Note—Reference to this parasite as being a new species was made in Vol. 1, No. 4, p. 334, this JOURNAL. P. L. Querens.

Digitized by Google

Concerning the Active Immunity of the Dog Against Canine Piroplasmosis (Babesiose canine).—(Bull. Soc. Path. Exotique, 1913, VI, 499.) A. Ciuca reports a case in which a dog, although in apparent good health, was in reality affected with chronic piroplasmosis during the nine months that followed the acute crisis of that disease. Toward the end of the chronic phase of the disease, the virulence of the animal's blood was feebly attenuated; he would infect puppies but without giving them a fatal disease. Finally complete cure did not prevent this animal from a second and fatal attack of piroplasmosis. This case confirms the observation of Nuttall and Graham-Smith. The author admits the identity of the parasite of Mathis which originated in Tonkin and that of Nuttall which originated in South Africa. In the discussion of this paper Laveran said that he had studied a piroplasma of indigenous origin and one of African origin, and that the animals seemed to develop an immunity against the same virus; but that they were susceptible to the other virus. He thought the indigenous and African piroplasmata were at least two distinct varieties if not two distinct species. John M. Swan.

Bronchial Spirochetosis.—(Journal of Tropical Medicine and Hygiene, Vol. XVI, No. 21, November 1, 1913, pp. 321-334.) Albert J. Chalmers discusses the prevalence of a bronchitis due to a spirochete found in Khartoum. The spirochete resembles the *Spirocheta buccalis*, but on account of its presence in the sputum of bronchitis patients, experimental monkeys, etc., it most probably is a distinct species, and similar to *Spiroschaudinnia bronchialis*. The symptomology is similar to that of an acute bronchitis, but mild, may have a tendency toward chronicity, and even associated with hemoptysis. Onset usually follows exposure with resultant chill. It may resemble the early stages of pulmonary tuberculosis. Pneumococcic complications are most frequent, among others being tuberculosis and malaria. The diagnosis is made by examining the sputum by dark field illumination; if this apparatus is not available, then simple fixing and staining with carbol-thionin or toludin blue. The differential diagnosis must be made from acute bronchitis, of adverse etiology, incipient pthisis, malaria and paragonimiosis, which can be excluded by appropriate diagnostic methods. The disease readily yields to remedial methods, such as rest in bed, good diet, ventilation, elimination, and arsenic associated with glycerophosphates by preference. The following is recommended: Intramuscular injection or by mouth. Sodium cinnamate, 0.05 gram; sodium cacodylate, 0.10 gram; sodium glycerophosphate, 0.10 gram. P. L. Querens.

The Life History and Habits of Spalangia muscidarum Richardson, a Parasite of the Stable Fly.—(Psyche, Vol. XX, No. 5, October, 1913, pp. 148-158.) Harry Pinkus, in describing the life history of this interesting little insect, discusses the possibility of artificial culture as an aid in exterminating one of our most expensive enemies, the stable fly (*Stomoxys*

Digitized by Google

calcitrans.) *Spalangia muscidarum* has also been found to attack other flies as well, among its hosts being the common "typhoid" fly (*Musca domestica*), *Hematobia serrata*, *Helicobia quadrisetosa*, and *Pseudopyrellia cornicina*. The female oviposits through the weakest part of the puparium (cephalic end), the young parasites developing in about eighty-eight days, development depending on temperature and allied conditions. The author has made possible, through an ingenious arrangement, the artificial culture of this valuable insect, which consists of a cage made from an ordinary honey box, measuring 8x14x9½ inches. Cuffs of soft muslin cloth are then tacked over the holes, which prevent their escape. The pupa are separated from the material which they occupy, placed in the box, and the young parasites allowed to hatch. The article is illustrated by five figures.

Note—this insect was referred to as a pahasite of the puparia of the stable fly (*Stomoxysis calcitrans*) in the November issue, Vol. I, No. 5, of this JOURNAL. P. L. Q.

Mechanical Transmission of Surra by Tabanus striatus Fabricius.—(Philippine Journal of Science, Vol. VIII, No. 3, Sec. B, Tropical Medicine, June, 1913.) M. B. Mitzmain reports in detail his carefully conducted experiments with *Tabanus striatus*, which were checked and controlled in a thoroughly scientific manner, and which show this fly to be a carrier of the trypanosome of surra. Those interested should consult his careful paper in the original. His conclusions are as follows: 1. *Tabanus striatus* Fabricius, for the first time recorded, has been found to play a rôle in the transmission of surra. Bred horseflies have been employed for the first time in such experiments. Errors resulting from naturally infected wild flies have thus been eliminated. 2. Three experiments were successful in the direct or mechanical transmission by "interrupted" feeding when only a short interval was allowed between the bites on infected and healthy animals. In sixteen experiments the minimum number of flies with which the infection could be transmitted was two. 3. Trypanosomes of surra were not found to be transmitted hereditarily in *Tabanus striatus* Fabricius. 4. The contaminated labellum of the fly does not appear to be a factor in the conveyance of infection. 5. The maximum length of time that *Trypanosoma evansi* has been demonstrated microscopically in the gut of this species of fly after feeding on infected blood is thirty hours; the organisms were found in the fly's dejecta two and one-half hours after biting the infected animal; and suspensions of flies, when injected subcutaneously, were found infective for animals for a period of ten hours after the flies had fed on infected blood. Creighton Wellman.

A Case of Infantile Leishmaniosis Followed by Cure. Leucocytic Formula of Leishmaniosis.—(Bull. Soc. Path. Exotique, 1913, VI, 495.) Quilichini makes a further report of a case of leishmaniosis (see Bull. Soc. Path. Exotique, 1912, V, 93) which seemed to be cured fifteen months after the relief of the general symptoms and the drop of the temperature.

Digitized by Google

Treatment with arsenic and iodine seemed to have assisted in the cure. It seems valuable to reproduce the blood findings in this case.

	During the Disease.		After the Cure.	
	January, 1912.	February, 1912.	November, 1912.	July, 1913.
Basophiles	0	0	0	4
Eosinophiles	0	0	0	0
Myelocytes	1	1	0	0
Metamyelocytes	2	3	7	3
Convoluted nuclei	10.6	4	22	3
Segmented nuclei	0	1	7	27
True small lymphocytes	78.6	81	0	2
True large lymphocytes	8	0	4	17
Leucocytoid lymphocytes	0	3	0	20
Lympholeucocytes	0.8	7	60	24

In the course of the disease there was a mononucleosis with an excess of the true small lymphocytes, a great diminution of the number of polymorphonuclears and a deviation to the left of the Arneth formula. In the course of the cure the number of polymorphonuclears increased, the Arneth formula returned toward the normal, the number of true small lymphocytes diminished markedly, that of the lympholeucocytes, on the other hand, increased, and at the time of the report remained above normal.

John M. Swan.

Digitized by Google

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed.

BOOKS.

Elements of Bacteriological Technique. By J. W. H. Eyre, M. D., Director of the Bacteriological Department of Guy's Hospital, London. Second edition, 219 illustrations. Philadelphia and London: W. B. Saunders Company. 1913.

This volume has for some time been well and favorably known as a concise, clear and reliable manual of bacteriologic technic. In this new edition a considerable number of additions have been made and a few revisions in older methods, bringing the subject matter *au courant* with present ideas prevailing in modern bacteriologic laboratories. The book is profusely and well illustrated with 219 illustrations. The directions, instructions and explanations are admirable in clearness and completeness and the writer of this review and his assistants have used the first edition in our laboratories and with a host of other workers will welcome this revision, which will render the work of even greater usefulness in the future. A point that should be highly commended is the great detail and simplicity which characterizes the exercises and description of the procedures, rendering the work specially suitable as a guide for the independent and isolated worker who is deprived of the advantage of study and review in established laboratories. The volume is altogether commendable, is well indexed and should be in every bacteriological and hygienic laboratory. Creighton Wellman.

REPORTS.

Twelfth Annual Report of the Institute for Medical Research, Kuala Lumpur, Federated Malay States. 1912.

The work of this Institute makes a creditable showing and investigations regarding beri-beri, leprosy, plague, epidemic conjunctivitis, blackwater fever, malaria, mosquitoes, and other questions are presented in detail. An account of the routine work of the laboratory is also given, with a list of the Institute's publications and news regarding the staff in charge. Creighton Wellman.

Archives de l'Institut Pasteur de Tunis. (Africa Minor.) Third Quarterly Report, 1913.

The Tunis Government's Pasteur Institute (French Protectorate) publishes every there months an official report of its activities, as a branch of the Department of Agriculture, Commerce and Colonization. Part 1

Digitized by Google

of the report, now before us, relates *in extenso* original researches, some of which have been reported already in scientific bodies, the most important reference being to experiments by Ch. Nicolle, L. Blaizot and E. Conseil, demonstrating the transmission of the Tunisian relapsing fever by *Pediculus vestimentorum*. Fed on infected men and apes, the louse, after thousands of bites, failed to carry infection in man and ape. A closer study, however, showed that the spirillum disappears and penetrates into the insect's lacunary cavity (not in the buccal apparatus) and remains there, alive, virulent, as long as its host lives. Man inoculates himself by crushing the louse, carrying with his finger nails which scratch the skin some of the lacunary contents, depositing the spirillum into the broken skin; or, inoculation takes place by way of the conjunctiva. Thus, the louse transmits both relapsing fever and typhus fever in North Africa; both deserve the denomination of "louse disease," in Arabis "*Mardquiel.*" The same prophylaxis applies to both. Conclusions about North African relapsing fever very likely apply to etiology of both spirilloses of Europe and America, but not to tick fever. The next article is a complete memoir by Ch. Nicolle and L. Blaizot, demonstrating the short duration of immunity in experimental relapsing fever, and the uselessness of crossed vaccinations with a view to differentiate the various spirochaetes of the *Obermeieri* group. The third article is a study of 160 cases of North African relapsing fever by E. Conseil. A clinical study showing that by its symptoms, its etiology and the characteristics of its pathogenic agency, it resembles closely the European relapsing fever or typhus, as some call it, and differs from tick fever. The fourth article is a report by E. Conseil on the results of treatment of relapsing fever with the new arsenical compounds, the chemiotherapy of relapsing fever; salvarsan, neosalvarsan, galyl, ludyl, have a curative action, prompt, final, harmless in relapsing fever. As a prophylactic they prevent relapses. They have a specific action on the spirillum. The other articles in Part I have references to: the utilization of ammoniac salts in the process of vinification, by M. Marcelle; the natural Leishmaniosis in the dog in Tunis, by Capt. A. C. H. Gray, physician to King George V Hospital of Dublin, in charge of a British Government Mission in Tunisia; the toxoplasmosis of the gondi, by Ch. Nicolle and Martha Conor, a complete memoir on the natural disease and the experimental disease; some new cases of "*Fièvre boutonneuse,*" by A. Conor, first described by himself and Dr. Bruch in 1910; an eruptive fever following the sting of a mosquito, first seen in Tunisia, and now reported to exist elsewhere also; additions to the catalog of blood-sucking arthropods in the Island of Djerba, by Aloys-Weiss; study of tryponosomes of Africa Minor, by E. Pringault; some aspects of the anti-malarial crusade in Tunisia in 1912, by E. Gobert; a case of pseudo-parasitism, by G. Catouillard; results with the Wasserman reaction test, at the Pasteur Institute of Tunis, in 1912, by L. Blaizot. Part II gives an account of the field work in 1912 by the various services of the Pasteur Institute of Tunis, namely, service of prophylactic vaccinations, cholera, typhoid fever, rabies,

Digitized by Google

smallpox; service of laboratory microscopical and macroscopical examinations; service of foods, industrial ferments, etc.; service of plague, examination of rats; service of malaria, diphtheria, tetanus, venoms, dysentery, cerebrospinal meningitis, tuberculosis, chiefly in reference to sera and other biologicals made and distributed by the Institute; a report of the researches, pubilcations and missions, in particular a detailed report on hydrophobia in Tunisia in 1912. Part III is given up to reviews and bibliography. Part IV gives supplemental documents, in which is noted the text of "*tracts*" in French and Arabic published by the anti-malarial service, to instruct the people as to the prophylaxis, the quinine distribution to the poor according to the station method. Allah is invoked, as it is the custom in all Arabic documents; first of all Allah appears as the head line. The writer of this review hopes that Allah will enlighten his wretched flock and help continue the wonders the French have worked in Tunisia, as in Algeria and Egypt, with good French blood and wits, money, time and perseverance. E. M. Dupaquier.

TRANSACTIONS.

Bulletin de l'Académie Royale de Médecine de Belgique. IV serie, Tome XXVII, No. 5. Bruxelles. 1913.

In this bulletin we note the following: Dr. Marcel Meunier, chief of the pediatric clinic of the University of Liége (Belgium), had presented to the Royal Academy of Belgium a very remarkable work, a manuscript memoir entitled "New researches on the true diphtheritic (Löffller) bacillus and the pseudo-diphtheric (Hoffmann) bacillus"—which appears, *in extenso*, in the present bulletin from page 418 to page 510. Mr. Van Ermengem, chairman of a committee to report to the Academy on said memoir, read his report, page 364, the summary of which is given here as follows: A positive diagnosis is made difficult by the very frequent presence in the rhinopharyngeal secretions of bacilli closely resembling the short Löffler forms. If they are pseudo-diphtheric bacilli—the view of the majority of German, English and American authorities—why inject serum and endeavor to rid carriers of harmless bacilli? If these ambiguous bacilli are true diphtheritic bacilli, with attenuated virulence—the view of Roux, and of most French authorities, and of Behring in Germany—their virulence may be increased, like that of the streptococcus and pneumococcus living as commensals in healthy persons. Prophylaxis should aim only at the virulent bacilli and it seems unnecessary to treat the whole of the 97% of persons in whose nasal secretions bacilli are present. Clinicians and bacteriologists must combine their efforts to differentiate more closely than heretofore the true from the pseudo bacillus, and to determine the part of the latter in spreading diphtheria. Mr. Meunier thinks that the short bacilli, with *no* metachromatic granulations, whose ubuquity is extraordinary, are a species without epidemiologic importance, and that it is useless to submit those persons whose secretions contain them to preventive measures. Indeed,

Digitized by Google

nothing goes to prove that they are degenerated diphtheritic bacilli. The Pfeiffer test, the fermentation test with various sugars, the pathogenic power tested in guinea pigs demonstrate no relation at all between them and the short diphtheritic bacilli except their morphologic resemblance. Mr. Meunier found them in the throat as often at the onset as in the decline of an attack of diphtheria, and observed that they disappeared less rapidly under the influence of antitoxin than the true dipheritic bacilli. They are equally frequent in persons far from an infected focus as in those in the midst of infected places; their ubiquity and dispersion do not connect them with their supposed part in the propagation of diphtheria. These observations were made by Graham-Smith, Arkwright and others, and tend to show that the pseudo-diphtheritic bacilli exist as a separate species, and are mere saprophytes, practically unoffending. There is no carrier of true diphtheritic bacilli, the cuneiform bacilli, who did not really show before an acute or chronic diphtheritic process. Those carriers, supposedly diphtheritic, whose previous history shows no diphtheritic infection, never, moreover, start any case of diphtheria in the most favorable medium for reception under most promiscuous conditions, schools, cribs, asylums, wards in hospitals. There is only one way to explain the absence of infectiousness in these carriers, observed by clinicians such as Max Kaber, Ustvedt, von Sholley, Stadler, Lippmann, Conradi, etc., either the short Löffler bacilli lose very easily their virulence by living on a healthy mucous membrane, unable to recuperate, or the avirulent bacilli as found in the multitudinous carriers referred to are totally foreign to diphtheria. The latter view or hypothesis is that of Mr. Meunier, and it seems likely to be the correct one. Practically, it is useless to waste time and money on carriers of short bacilli because they are not dangerous. All our efforts should be centered on convalescent and healthy persons who are carriers of the *typical Löffler bacilli*, and their treatment must be energetic, namely, isolation, massive doses of concentrated antitoxin, persistent abundant irrigations of the nose and throat with plain boric acid solutions. This procedure has given Mr. Meunier satisfactory results; the healthy carriers are not so numerous among infected persons, and the bacilli in them have but a weak virulence, as they seldom persist in their secretions. A vote of thanks was heartily given the author of the paper and the order of publishing it in the Bulletin of the Royal Academy was adopted. In the discussion, Mr. Lucien Baco stated that he was pleased indeed to have heard the report of Mr. Von Ermengem on Mr. Meunier's work, approving the latter's views, views which he, himself, had already advanced ten years ago in a paper published then in the Bulletin and which the same gentleman, Mr. Von Ermengem, had opposed at the time. E. M. D.

JOURNALS.

Exanthematic Typhus. Gaceta de Mexico, August, 1913.

This Journal devotes an entire number to an exhaustive study of

Digitized by Google

exanthematic typhus. Dr. Ignacio Prieto opens the symposium with a description of his technic and results of experiments on dogs and rabbits. He refers to observations made by him in 1910, and follows up his description with new material. He injected into the peritoneal cavity of a dog, kept under test conditions, on September 2, 1900, 2 c. c. of blood from a typhus patient on the eleventh day of the disease. The disturbance of temperature in the dog began on the fourth day, rising further on the fifth, and remaining constant until the evening of the tenth day; this was followed by four days of wide oscillations; and the temperature became normal after the fifteenth day. The total period of thermic perturbation was ten days. The dog's weight fell from 18,800 grams to 17,600 grams on the ninth day; on the twentieth day he had regained his normal weight. When forced to walk, the dog presented the gait common to animals inoculated with typhus. This gait began on the sixth day, increased until the eleventh, and disappeared the day before the thermic perturbation ended. On the eighth day after the inoculation, blood was drawn from the ear, gathered in a sterile flask, and at once placed in a refrigerator; after being four days in the refrigerator, inoculations were made in broth, agar, and gelatine. Fresh cultures were made every five days. A second dog was inoculated by the peritoneal route, on October 10, 1910, with two grams of the broth culture of 48 hours. The temperature began to rise on the evening of the third day, reaching its maximum on the eleventh day; it descended on the twelfth day for a while, but quickly rose again and remained elevated until the twentieth day, after which it became normal. On the third day, vomiting occurred; on the fourth day, injection of the skin where this was not covered by hair; also, congestion of the gums; and, on the eighth day, petechiae appeared. From the twelfth to the fifteenth day the animal did not eat; diarrhea set in, and the animal did not get up. From the fourth to the twentieth day, the characteristic gait was observed. The animal gradually lost weight at first, but regained it after his appetite returned. Another series of dogs was inoculated with blood from the dogs inoculated with broth-cultures from the pioneer dog, which had been inoculated with blood from a typhus patient. It is not necessary to give these experiments in detail. The first step demonstrated the virulence of the blood of the culture-dog, since the animal that received it showed a longer and profounder thermic disturbance than the first; on the other hand, the accompanying phenomena were not as marked either in intensity or duration, as those presented by the culture-dog. The second step was not at all like the preceding; indeed, for several days the general conditino of the subject of the experiment scarcely changed at all, so that it would seem that the virulence expired after the first step (inoculation). Thus, Dr. Prieto produced in a third dog, by means of a culture from the blood of the first dog, the same series of phenomena as he found in the animal originally inoculated with the blood from a typhus patient. Following out this line of investigation, Dr. Prieto succeeded in immunizing dogs, so that they did not react when

Digitized by Google

inoculated with blood from a typhus patient. Experiments along these lines seem conclusive. The circle is complete, and, from an experimental standpoint, observations lead us to definite conclusions concerning the nature of the material employed. The dog inoculated with a culture has remained indifferent to injections of typhus-blood. The controls reacted, while the others remained unaffected, whereas, after the inoculation of the culture, it offered a symptom-complex like that presented by animals inoculated with typhus blood. The inference is obvious. Experiments led Dr. Prieto to the cultivation of a germ which, when injected, produces a symptomatic picture exactly like that caused by inoculation of the blood of a typhus patient. Prieto's numerous experiments were made (1) with blood drawn from a dog inoculated with typhus blood; (2) the blood of rabbits inoculated with red bone-marrow from the cadaver of a typhus victim; (3) blood from a typhus patient directly added to culture-broth and immediately incubated; (4) blood from inoculated rabbits, which can easily be extracted from the ear; (5) mucus from the pharynx, planted in culture-broth from the second to the fifteenth day. When this last is kept at 37° C. for twenty-four hours and injected into the peritoneum of the rabbit, the blood drawn from the ear shows, when treated with osmic acid, the germ of typhus in one or more of its forms; and other forms are found in subsequent cultures. The cultivation of the germ of typhus exanthematus in broth presents three forms of development. In the first, growth is abundant, the medium becomes uniformly turbid in twelve hours; from 18 to 24 hours, whitish deposits form in the sides of the container, with an abundant sediment at the bottom; the deposit adheres to the sides of the test tube. Later on the sediment increases, but the liquid remains turbid. When the culture is old, all of the deposit falls t othe bottom, and the liquid becomes clear; when shaken, it takes several days to clear again. The second form of growth in broth is characterized by a moderate development of the deposit, while the liquid remains clear. On shaking the tube, the deposit appears as filaments, showing that development has progressed further. In old cultures (three or four months), the liquid and the deposit take on a creamy color; they still retain the power of reproduction. The bacteria grow in milk without causing coagulation. In solid media, the following characters are observed: On agar (gelosa), streaks grow rapidly, with circular, independent colonies alongside, having regular borders of a dirty white color, raised, and having a smooth, shining surface. In 48 hours, the colonies coalesce, and form a single mass. From the sixth to the ninth day, the surface of the culture is made irregular by the appearance of new colonies which develop at the level of the primitive line of inoculation. In a stab-culture, the deeper part consists of smooth, circular, spherical colonies, of a milky color; these colonies are small and isolated after incubature for 24 hours. The upper part consists of blended white colonies, with regular borders. On agar (gelosa) plates, in 24 hours, small, white, circular colonies appear, with a smooth surface. In three days the growth is much greater. By transmitted light,

Digitized by Google

the colonies show a dark center. On gelatine, the streak-cultures appear in 24 hours. The magnifying glass shows small colonies, circular in form, prominent, shining when view tangentially, colorless by direct light, and white by transmitted light. Growth occurs by the development of new colonies that appear in the central portion of the streak. On the third day the colonies coalesce in a measure. The medium liquifies in the course of a second week. In stab-cultures, the deeper part looks opalescent in 24 hours; in 48 hours, small, circular, white colonies appear. The upper part is prominent, circular, white. About the ninth day, the upper part moves when the tube is inclined; the medium is liquified, forming a cupola, and the liquefaction extends later to the entire upper zone. On gelatine plates, small circular colonies appear in sixteen hours, having a whitish color. Growth is slow—on the seventh day, scarcely any change has taken place. The morphology of the specific organism forms the most important chapter, on account of the changes it presents, the distinct aspects it assumes, and the different phases it undergoes during its growth. This is the principal source of difficulty, because it never presents the same form, but changes in size and appearance. Investigators expected to find the organism always under the same form, and this is the reef on which they all struck. Following up a culture step by step, making an examination of it three or four times in 24 hours, and keeping it up for two or three weeks at least, we can keep up with its changes, forms, and cyclical characters, as well as the increase in size and aspect that it undergoes in the course of these periods. Observation of broth-culture is the best mode of carrying on this study. Two methods are available: smears from the blood of an infected dog may be made, or a successful culture may be used. The first thing that strikes the observer is the change that is noted, for in the culture-preparation groups of various sizes are found, well differentiated bacillary forms, well-defined diplos or sarcinae, and, in the examination of the new culture made after 8 or 12 hours of incubation, when the turbidity of the liquid shows that the organisms are growing, none of the primitive elements are found, and, instead of these small amorphous groups, unrecognizable diplos with pointed ends, five bacilli with thin extremities, and a large quantity of small, dark, circular bodies, variously scattered over the field, either free or gathered in small groups. On the other hand, the fat bacilli, the sarcinae, which were the forms that were inoculated, were not seen, for they had entered upon the sporulating stage, and this phenomenon is the first one observed. The same transformation is observed in specimens drawn from inoculated blood. In 12 hours, the spores have already run together and formed small, rounded groups which appear as minute, over-stained spots. In 18 hours, these groups break up and give rise to small, slender bacilli, with tapering ends, showing spores in their interior, larger spores than the primary ones. For the greater part, these spores stain intensely. The bacillary forms are of different sizes, like the groups from which they spring. In twenty-four hours, the spores which have just appeared, arising from the bacillary

Digitized by Google

forms described, gather into groups, which overstain; they contain no elements in their interior. These groups are larger than the previous ones, are usually circular in form, to which we have given the name of "globus bodies." In 36 hours, new groups appear, larger in size, overstained and shapeless, which develop in 48 hours into bacillary forms longer and thicker than the preceding, and from which arise spherical elements much larger than the primitive spores, taking the stains less firmly. The spherules group themselves in pairs, and these latter form double pairs, resembling sarcinae. Under high amplification, these sarcinae are seen to be formed of diplos arranged in parallel rows like palisades; the assembled spherules are united at their points of contact by a fine membrane, and, further, they vary slightly in their diameters, the long diameter being parallel with the axis of the diplo. It has already been pointed out that the groups develop into the bacillary forms; but not all the groups are of the same size, and the bacilli that spring from them are not of the same dimensions, varying from the small ones, resembling the pneumococcus, to the thick bacillus with rounded ends. All the elements are born under the bacillary form, and, later on, they assume the form of chains, due either to the disappearance of the enveloping membrane, or the escape of the contents of the bacilli; so that we may encounter chains consisting of spherules, or pseudo-pneumococci, or thick bacilli. We may also find all of these diverse united in a single chain. The spherules vary somewhat in shape and size, some of them being perfectly circular and others elliptical. No doubt the remarks made concerning cultures from the blood of typhus patients will cause surprice, since all observers have repeatedly said that blood is negative in culture media. Among the patients examined was a hospital employee, whose blood showed, on the second day, slender, sporulating bacilli, free spores and sporulating globular bodies. From that day on, the examination of the blood revealed the nature of the disease. The second examination was made on the fourth day, and showed spherules and sporulating groups. The clinical diagnosis was not made until the sixth day, four days after a microscopic examination of the blood had demonstrated the nature of the disease. In another case, admitted to the hospital on the second day of the disease, the blood showed various forms of the typhus germ. Inasmuch as the pulmonary phenomena of this patient, in addition to the absence of reaction, did not, on the fourth day, correspond to the blood findings, Dr. Prieto drew some blood from the median vein and injected it into the peritoneal cavity of a dog; at the same time, another dog was inoculated with blood from another patient in the same ward, on the sixteenth day of his disease. Both animals were taken sick in the same manner, and both presented the identical clinical phenomena which followed in the same order. This experiment, in addition to the examination of the blood, which was made at various times, and always with the same result, led Dr. Prieto to believe that the germ of typhus plays an important part in the pulmonary process. This and other experiments caused him to suspect that a patient might become "bacilliferous,"

Digitized by Google

that is, a "typhus-carrier," just as some persons are "typhoid-carriers." With this end in view, he examined the blood of a patient who had had typhus two months before, and he found small groups of bacilli of various forms of development resembling those observed in the patient's blood during the course of the disease. However, this phase of the subject remains to be studied. Much space is given in this journal to a translation of an article by Dr. Markus Rabinovitsch, of Kieff, Russia. This article was published in 1910, and calls for no extended notice here, since it has already passed into medical history. Another long section is devoted to translations from the text-books of E. Legrain, Alcide Treille, and Roger Treille, on serum-therapy in typhus exanthematicus. The communications of these writers date as far back as 1895, and have become part of the established order. We are concerned here only with the contributions of the Mexican investigators; and these, it must be admitted, reflect great credit on Mexican medicine, and reveal to us a field of endeavor that has largely been overlooked in current literature. The latter part of this voluminous journal is made up of discussions held at the Academy of Medicine of Mexico. These discussions are marked by an acrimony rarely equalled in medical literature, but we must pause long enough to hear the claims of Dr. Otero, who says that he was the first to demonstrate experimentally in Mexico the eruption of typhus germ in the blood, and also claiming priority in the employment of serotherapy in typhus, with the blood of convalescents from that infection. Dr. Otero is indignant that the Committee on Typhus, of the Academy of Medicine, should have awarded to Legrain the priority of serotherapy in typhus. Dr. Otero claims that Mexican typhus is due to a hematozoon similar to that of Laveran, which enters the blood probably through the red marrow or the spleen. He calls this germ the "Petechial amoeba." A. McShane.

REPRINTS.

Barnes, Harry Lee. Preliminary Report on 120 cases of Tuberculosis Treated with the Friedmann Vaccine. Reprinted from The Providence Medical Journal, November, 1913.

Bates, John Pelham. Review of a Clinical Study of Malaria Fever in Panama. Reprinted from The Journal of Tropical Medicine and Hygiene, 1913.

Bishopp, F. C., and Wood, H. P. Biology of some North American Ticks of the genus *Dermacentor*. Reprinted from Parasitology, Vol. VI, No. 2, July 16, 1913.

Cook, F. C. Bouillon Cubes: their contents and food value compared with meat extracts and home-made preparations of meat. Bulletin No. 27, U. S. Department of Agriculture.

Digitized by Google

Crowder, Thomas R. On the Reinspiration of Expired Air. Reprinted from Archives of Internal Medicine, October, 1913, Vol. XII, pp. 420-451.

Freeman, Rowland G. Diagnosis and Treatment of Pyelitis in Infancy. Reprinted from the Amercian Journal of Diseases of Children. August, 1913, Vol. VI, pp. 117-121.

Knab, Frederick. New American Phlebotomus. Insecutor Inscitiae Menstruus, Vol. 1, No. 2, November, 1913.

Nicholson, J. F. Studies in Hygiene. Printed by The Idaho State Board of Health.

Phillips, W. D., and Lanaux, M. Thomas. Frequency and Causes of Stillbirth. Reprinted from New Orleans Medical and Surgical Journal, Vol. 66, No. 4, October, 1913.

Wisconsin County Life Conference. Rural Social Development. Bulletin of the University of Wisconsin. Serial No. 591, General Series No. 413.

PRINTED AT THE TULANE UNIVERSITY PRESS, NEW ORLEANS, U. S. A.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CREIGHTON WELLMAN, M. D. ..... EDITOR-IN-CHIEF
CHARLES CHASSAIGNAC, M. D.
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine
JOHN M. SWAN. M. D., Secretary, American Society of Tropical Medicine } *ex officio.*
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M. D., University of Pennsylvania
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. JANUARY, 1914 NO. 7.

EDITORIAL

The Prevention of Cancer.—Half a century ago cancer attracted occasional attention because of the usually fatal outcome of cases applying for treatment after the accepted methods were no longer available. Surgery was limited to exceptional regions, most of areas exposed to view. Within the past twenty-five years more progressive surgery has eventuated and with this field of development more and more cases of cancer have reached the operator's knife.

Civilization has brought in its rapid development not only many advanced methods in scientific practise, but the occasion for their application has grown as well. The incidence of cancer has appeared to grow with enormous increase during the last two decades.

To-day the great number of cancer cases has occasioned a wide-spread interest in the theories of this evil and in the methods best suited for its elimination.

Digitized by Google

Everywhere the epidemiology of cancer is being studied and nests of cancer cases are being found in the larger cities. One idea after another evolves in the probable causation of the disease, and heredity, diet, microbiology, environment, occupation, and many other factors are advanced among the things responsible for the malady. Notwithstanding the many minds engaged we are not yet advanced far enough along the road of investigation to proclaim any one causal factor nor to assure ourselves of any beacon light leading us out of the mystery of a malign disease.

The blight of cancer comes to all of every age, sex and race, and while it may predominate in some one or another type, the fact remains that the disease is on the increase and that the prevention of cancer is as important as the cure.

Large sums have been devoted to research laboratories and now it is proposed to create government interest and control in the radium resources in the United States with a view to conserving the supply of this healing element in the treatment of cancer.

The surgeon grows more and more bold in the attack upon organic malignant tumors, and the local treatment of milder types offers a constant protection against the development of cases recognized early.

Educational propaganda are under way and the periodicals of secular type are full of general articles dealing with cancer and its probable prevention.

It is time to take strong measures in the attempt at the education of the profession and the public, too, in the matter of early recognition of cancer, for when early diagnosis is made, early prevention is more and more possible.

No specific has yet arisen which can immunize the individual against cancer, but the contributing factors may be considered and combatted. The study of every case of simple keratinous

Digitized by Google

growths must end in the thorough removal of such by the various measures at hand. Pigmentary tumors should excite caution or interference and every ulcer of long duration should indicate the necessity of careful differentiation of the causal factors or complicating diseases.

What may be a blemish at twenty years of age may prove to be a menace at forty, and the general public should be more and more enlightened on such conditions.

The signals of distress are out in cancer incidence in this country and the number of cases grows all the time, and this very fact argues that the concentration of many minds may crystallize into something of moment, for prevention and for cure, even though no panacea can as yet be discovered.

Isadore Dyer.

The Investigation of Pellagra.—There is probably no one scientific problem more actively before the profession to-day than pellagra, and there is no phase yet sufficiently settled to be laid aside. Not only is the cause of the disease unknown, but the treatment is at present in a chaotic state, for one observer argues for therapy on the neurologic side, another insists upon serotherapy, while others treat the disease upon a parasitic, gastro-intestinal or other basis, and finally a large array of empiric treatment has been presented. The epidemiological study of pellagra has materially advanced and the prospect of further progress is excellent, since the public health service as well as other government departments have interested themselves in the problem. The excursion of Sambon and others to the West Indies and the Caribbean Islands may throw more light on the protozoal side, but as yet no real clue has been evolved leading to the explanation of the symptom complex in this old yet still strange disease. The hygienic aspect has assumed importance with the growing popular notice of pellagra, and the many

Digitized by Google

fatalities from the disease have occasioned apprehension among the communities of its incidence, not only so far as the people are concerned, but among health authorities also.

The question already imminent is the contagiousness of pellagra and the degree of segregation necessary for the protection of the public. As yet no one may intelligently answer this question with any assurance of conviction or authority. We may speculate upon the epidemic nature of pellagra; that it spreads in the individual household and in the community is certain. It is not possible at this time, however, to declare the manner of the spread of the disease, although the evidence points to an intermediate host, or to the fact that the disease is insect-borne. The segregation of the pellagrin, then, would secure only part of the needs of prevention of pellagra and would be futile if further precaution against the real transmission were neglected.

Meantime almost every section of the country presenting cases of pellagra affords the opportunity for investigation and original work is being carried on by men with different points of view. It is certain, then, that we shall arrive before long at the real cause of pellagra and the way will be clear to the other phases of the disease. *Isadore Dyer.*

Digitized by Google

ORIGINAL ARTICLES

HUMAN TRYPANOSOMIASIS: REPORT OF A CASE OBSERVED IN BALTIMORE.*

By J. A. CHATARD, M. D., and C. G. GUTHRIE, M. D.
(From the Clinical Laboratory of the Johns Hopkins University and Hospital, Baltimore.)

1. *Introduction.* So far as has been ascertained, human trypanosomiasis in endemic form occurs only in Africa. The disease discovered in Brazil by Chagas[1] is of a quite different nature, and the causative organism, *Schizotrypanum cruzi*, having an intracorpuscular stage, resembles a true trypanosome at only one period in its development. Imported cases of human trypanosomiasis have occurred in the New World, a considerable series among laborers from the west coast of Africa having been studied by Guérin[2] in Martinique. Only one case, however, has been reported in the United States, that recorded by Camac[3] in 1911. The patient was an English engineer who contracted the disease in the Congo region in July, 1907. He returned to England in the fall, at which time trypanosomes were repeatedly found in his blood. In October, 1907, he came under the care of Sir Patrick Manson,[4] who reported the findings in this case up to December of the same year. Then, as the patient wished to come to America, he was referred to Dr. Camac in New York, under whose care he remained for nearly four years. During the first half of this period, trypanosomes were found in his blood from time to time, and he exhibited many of the characteristic symptoms of the disease. Treatment with atoxyl was without effect in arresting the malady. Following the use of antimonial compounds, however, the symptoms disappeared, and at the time of the report the patient had been free from them for two years and was still alive more than four years from the date of infection. The results of animal inoculations are incompletely reported.

*Read at a meeting of the American Society of Tropical Medicine, May, 1913, Washington, D. C.

Digitized by Google

In view of the interesting nature of the disease and its extreme rarity in this country, the following case is reported in some detail.

II. *Case Report.* The patient was first seen by us on July 2, 1912, and the impression obtained on this, as on subsequent occasions, was that the man was fairly well educated, of more than average intelligence, and his statements reliable.

Condition: White; male; poultry-farmer; aet. 37; born in Belgium.

Complaint: "Sleeping sickness."

Past History: Health good until age of twenty-two, when he went to Africa in the service of the Belgian government. He spent the next twelve years in the Congo region as a soldier and agent in the rubber trade, during which time he contracted several tropical diseases, among which were amebic dysentery in 1898, and again in 1904; frequent attacks of malaria, and in 1903 black water fever. He also contracted a disease of obscure nature, prevalent among the natives at the time. According to his description, the attack lasted twelve days, and was characterized by fever, delirium, and the presence of a skin rash. There were four days of fever, the temperature falling as the rash appeared, with a subsequent rise. The rash was general over face, body, and extremities, and appeared in the form of red dots which later became raised, but did not become vesicular. The patient was unable to give a name to this complaint, which he said was peculiar to natives, and that he was the only white man, so far as he knew, who had had it. As the patient had been successfully vaccinated, he felt convinced that the disease was not small-pox.* In 1908 he contracted sleeping sickness. Gonorrhea and soft chancre in 1899. No history of secondary luetic symptoms. Married nine years. Wife living and well. One child, eight years old, well and strong.

During the earlier part of his African service he was assigned to duty in the forests where the rubber is collected and where, even now, sleeping sickness is unknown except for im-

*A search through the available works on tropical medicine has failed to reveal the nature of this malady.

Digitized by Google

ported cases from along the rivers and lakes, where the tsetse fly is present. In his last enlistment, which began in February, 1908, however, he was stationed at a post called Bumbuli, in the district of Lac Leopold II, on the Lukenye river, a branch of the Kasaï, which in turn flows into the Congo. Here he lived at this river post, which served as a forwarding point for the rubber received from the interior, until November, 1908, when he became quite ill.

Present Illness: Without noticeable prodromal symtoms, he developed a high fever, which was not intermittent, but constant and unaccompanied by chills or delirium. He was confined to bed and was unable to take food, owing to nausea and vomiting. After two weeks the gastro-intestinal symptoms disappeared and he felt somewhat better, but still had some fever. On attempting to wash himself he felt enlarged glands in his neck and suspected that he had sleeping sickness. From this time he was greatly depressed, "was tired all over," had a feeling of drowsiness, marked shortness of breath and palpitation. There was no definite pain, however, and his appetite increased to tremendous proportions. He wrote at once to the head of the district at Inongo on Lac Leopold II, telling of his fever and adenitis and, after three weeks, he was transferred to the government hospital at Leopoldville, where an Italian physician made an immediate diagnosis by aspirating a cervical gland. In the hospital he was treated with injections of atoxyl in the buttocks q. 4 d. and some medicine (probably tartar emetic) intravenously q. 4 d., thus receiving medication every second day. This was continued during the nine weeks of his stay in the hospital. After about a fortnight the patient felt much better. Gradually the drowsiness, lethargy, and tired feeling disappeared, and when discharged he felt as well as ever. The glands were smaller, no longer visible, but still palpable. During the voyage back to Antwerp the same medicine was administered and also at the Villa Colonial, where he came under the care of Dr. Emil VanCampenhout, who told him that the treatment must be kept up as long as he lived or the trouble

Digitized by Google

would recur.† He took atoxyl injections for one month after leaving the Villa Colonial, but as he felt perfectly well and had felt so for some time, he stopped them, and since then has had no treatment at all, a period of about three years. He came to America two months later (August, 1909), living first in New Jersey, then in New York, for ten months in Maryland, and being in turn lace merchant, gardener, clerk, butler, steward on a yacht, and latterly, superintendent of a chicken farm. He had no sign of ill health after coming to this country, except for a few weeks in the summer of 1911, when he felt tired, disinclined to work, generally below par and occasionally had slight fever in the evening, but no pain, nor did he believe himself really sick. He got better with rest and quinine and felt perfectly well until the onset of the present symptoms.

Recent Symptoms: Five weeks before he came under observation of the writers, the patient began to feel drowsy, "had no courage to do whatever it is," and at once suspecting a return of his African trouble, felt his cervical glands and found them considerably larger than they had been for years, and since then they have gradually doubled in size. The drowsiness, lethargy, and tired feeling, at first intermittent, later became constant. His appetite increased greatly. There was palpitation and dizziness on exertion, and an aching soreness in the calves of his legs, but no definite pain. He became easily depressed and wept on the slightest provocation. There was some unsteadiness in gait, so that he was unable to walk in a straight line and had difficulty in walking at night. Since the onset of his symptoms in 1908 he has never observed anything resembling the circinate erythema frequently present in human trypanosomiasis, nor has he suffered from the deep hyperesthesia of the extremities, described by Kerandel.[5] In short, his symptoms were practically identical with those he had had in Africa three and a half years before, so that the patient felt confident

†A letter from Dr. VanCampenhout, dated August 6, 1912, states that when the patient was seen by him in May, 1909, trypanosomes were found in the blood, but none in the gland juice. Lumbar puncture was not attempted as the patient was in the first stage. Autoagglutination of the red blood cells occurred rapidly. The man was under his care only about a week, and the case has never been reported, so far as he knows.

Digitized by Google

1

2

3

4

5

6

CHATARD AND GUTHRIE TRYPANOSOMIASIS

EXPLANATION OF PLATE

Figs. 1, 2, 3 and 4. Fresh red blood cells (white rats adherent to the parasites. Fig. 5. Stained blood, long, slender forms. Fig. 6, short stump and dividing forms. [Drawings by Herman Becker].

Digitized by Google

Digitized by Google

of their cause, and being unable to work, he notified his employers of his suspicion. One of us was consulted and sent the patient into this hospital for diagnosis.

To summarize, then: the patient's history was practically negative until he went to the tropics. While there he suffered with malaria, black water fever, amebic dysentery, some obscure exanthem and trypanosomiasis. The last named disease was contracted in November, 1908, three and a half years before, and for three years he had considered himself cured as the result of nineteen weeks of treatment. During the past five weeks there has been a return of all his former symptoms.

Physical Examination: Well nourished man. Scleræ clear; pupils equal and reactions normal. Slight pallor of mucous membranes. Lips somewhat cyanotic. Thyroid normal in size. Tonsils hypertrophic. General glandular enlargement, involving cervical, axillary, inguinal, and epitrochlear glands. In the posterior triangles of the neck and beneath the angles of the jaw were many glands varying in size from 0.5 to 2 cm. in diameter. They were discrete, firm, not tender nor adherent to the skin. Heart and lungs normal. Abdominal examination was negative except for a large, firm spleen, extending 6 cm. below the left costal margin. Extremities: Knee kicks and biceps reflexes exaggerated. Plantar response normal. Romberg's sign negative. Tibiæ smooth. Several small pigmented scars 0.5 to 1 cm. in diameter and a few small elevated red areas about 4 mm. in diameter, resembling insect bites on legs.

Urine: Clear, orange; acid; sp. grav. 1026 to 1031; no sugar; occasionally a very faint trace of albumin and one or two granular casts. There was acetone present on one occasion and urobilin was demonstrable at each examination. The diacetic acid, diazo, and occult blood tests were negative.

Feces: Normal in color and consistence; bile present; occult blood tests negative; no parasites or parasitic ova found.

Wassermann Reaction: Negative.

Blood Pressure: 115 mm. Hg.

Blood Examination: R. B. C. 4,672,000; W. B. C. 14,000; Hb. 90% ; color index 0.957.

Digitized by Google

Differential leucocyte count:

Polymorphonuclear neutrophiles	104	41.6%
Polymorphonuclear eosinophiles	0	0.0%
Polymorphonuclear basophiles	1	0.4%
Small mononuclears	137	54.8%
Large mononuclears	8	3.2%
Transitionals	0	0.0%
Myelocytes	0	0.0%
	250	100.0%

Stained Blood: No anisocytosis or poikilocytosis; R. B. C. show basophilic staining, both punctuate and diffuse; a few normoblasts seen; no parasites discovered. In searching for trypanosomes many fresh preparations of blood were examined for several hours without finding any parasites; no autoagglutination observed.

Concentration Methods: (1) The examination of many thick smears prepared and stained by a modification of the Ross-Ruge method revealed no parasites; (2) 10 cc. of blood was drawn into physiological salt solution containing 1.5% sodium citrate, centrifugalized for fifteen minutes, when the supernatant fluid, including the leucocytic cream, was pipetted off and again centrifugalized, the sediment of red blood cells being discarded. This procedure was repeated three times. Smears were made of the sediment and examined fresh, stained and in hanging drops, with negative results. Six cc. of the patient's blood was used for intraperitoneal inoculation of two white rats, which, however, remained healthy.

Lumbar Puncture: Fluid clear and colorless; rose to a height of 110 m.; 12 cc. withdrawn. Cell count 2 (lymphocytes) to the cu. mm. The total amount was centrifugalized at medium speed for fifteen minutes, at the end of which time there was scarcely any appreciable sediment. The supernatant fluid was withdrawn and fresh preparations made from the bottom of the tube. Examination of these showed lymphocytes; no polymorphonuclears and no parasites. Stained films gave the same result. Salt solution was poured into the centrifuge tube

Digitized by Google

and, after thorough mixing, the contents used for the intraperitoneal injection of four white rates, without resulting infection.

Gland Puncture: A large lymphatic gland on the right side of the neck was aspirated by means of a syringe and a small needle. A drop of fluid was obtained, examined fresh, and one motile trypanosome found.

Excision of Glands: Two cervical glands were removed from the left side under cocaine anaesthesia by Dr. Heuer. A portion was submitted to Dr. Whipple for histological examination and the remainder cut up into small pieces. Six white rats were inoculated by placing a tiny bit of this tissue in the peritoneal cavity and each animal became infected with trypanosomes. In six fresh preparations, made by pressing out the tissue juice with forceps, only one trypanosome was found and none were discovered in a number of stained films.

Histological Report by Dr. Whipple: The gland shows no increase in connective tissue elements. The lymph follicles show active hyperplasia, their central portions being filled with large, pale-staining, mononuclear cells. Some of the lymph sinuses are dilated with mononuclear cells and occasional red blood cells. Polymorphonuclear cells are very rare. There is no active phagocytosis by the large mononuclear endothelial cells. In the marginal sinuses one finds an occasional large mononuclear eosinophile, as well as red blood cells and mononuclear cells of every type. The Gram stain is negative.

Therapy: He received salvarsan, 0.55 gm. intravenously on July 5. On the following evening he developed a severe headache, but no other ill effects were noted.

He left the hospital on July 8 feeling better than at any time since the return of his symptoms five weeks before; he was less tired, clearer mentally, and more able physically.

On July 27 he was seen again, when he said that the headache, which began about twenty-four hours after the salvarsan injection, lasted for twelve days, but that for a week he had been free from it. His drowsiness had disappeared and his appetite gradually returned to its normal level. He felt sure he had had no fever for at least eight or ten days.

As on the former occasion, the man believed himself cured

Digitized by Google

as soon as he was free from symptoms. He was in excellent spirits and, although he had just been granted a pension by the Belgian government and wished to go back at once, he volunteered to remain under observation for a year if necessary and to submit to any further treatment that might be considered desirable. It was purposed to give him repeated injections of salvarsan at frequent intervals until some of the newer antimonial compounds could be secured for trial. We did not have the opportunity to do this, however, as the patient disappeared soon after and we never saw him again. It was learned from his employers that his symptoms recurred and, while suffering from the depression which was a marked feature, he returned to Belgium. Every effort was made to trace him in order that he might receive active treatment, but for months he could not be located. Dr. VanCampenhout, whose aid was enlisted, wrote that he believed that the man wished to escape detection or else was very ill, as all letters addressed to him remained unanswered, even those sent in care of the Pension Bureau.

The following extract from a letter written by Dr. VanCampenhout on June 5, 1913, contains the last information received concerning the patient: "Five minutes ago I was informed that your man has been admitted to one of the provincial hospitals near Brussels, in a very low state. He is comatose and presents symptoms of Jacksonian epilepsy. I think he is in the last stages of his malady, which will probably end fatally in a few days. It was through finding one of my letters in the man's pocket that the authorities came to notify me. I saw the fellow in the first period of his illness (1909) and at that time there was a chance of curing him. He escaped, however, and did not present himself any more for treatment, just as he did with you."

III. *Animal Inoculations.* Twelve white rats were inoculated with material from the patient, and in each instance the animals were carefully examined for the presence of *Trypanosoma lewisi* before injection. No rats infected with this organism have been discovered in our series.

Blood: Two animals received 6 cc. of blood drawn directly from the arm vein of the patient, 3 cc. being injected into the

Digitized by Google

peritoneal cavity of each rat. They showed no symptoms at any time following this procedure and frequent examinations over a period of twelve months revealed no trypanosomes in the blood.

Cerebro-spinal Fluid: The scanty sediment from 12 cc. of cerebro-spinal fluid was used for the intraperitoneal inoculation of four rats. These also remained free from symptoms and their blood free from trypanosomes.

Gland: The six animals that had bits of gland placed in the peritoneal cavity, however, all became infected. Trypanosomes were first found between two and three weeks after inoculation and in each instance the animal showing them appeared dull, sleepy, and rough-coated. The trypanosomes were scanty, one or two, sometimes three, being found in an entire fresh preparation. Autoagglutination was not observed in the blood of infected rats, which is in accord with the observation of others, who agree that this animal does not exhibit the phenomenon. The organisms disappeared from the peripheral blood in a week or two and the rats quite recovered their normal habits and appearance. Examinations of the blood were made every day or two and for a long time they continued to be negative. In each instance, however, the animals suffered a relapse after a variable period of from two to five months, when the former symptoms recurred and an examination of the blood revealed the presence of trypanosomes much more numerous than at the time of their previous appearance, sometimes three or four in a field of the 1-12th lens, but never so abundant as in an animal infected with *Trypanosoma lewisi.* The organisms present in this late stage of the disease differed from those observed during the early period in that a much larger percentage of the short, stumpy forms were present. Although many hundreds of trypanosomes were examined, none were found with the posterior nucleus characteristic of a certain stage of *Trypanosoma rhodesiense.* Many dividing forms were observed and there was much individual variation as to length, breadth, and the degree of granulation present in the bodies of the organisms seen. After the onset of the relapse, if it may be so called, the animals succumbed in a short time, usually inside

Digitized by Google

of two days from the reappearance of trypanosomes in the blood. Numerous transfers were made to normal animals and the strain was in its third passage in rats, when all were lost in a laboratory epidemic. Fresh animals were secured and inoculated from the dead and dying ones, but, as was to be expected perhaps, they too promptly died from the epidemic disease and the trypanosome strain was lost. This was especially regretted, as attempts at cultivation of the protozoa in vitro had to be discontinued. After the death of one of the rats infected by means of gland tissue, in addition to the usual transfers by means of intraperitoneal injection of blood from the heart, three uninfected rats were fed strips of liver from the recently dead animal. These rats were kept apart from the others and so escaped the epidemic. For ten months they remained free from symptoms and repeated examinations of the blood were negative for trypanosomes. At the time of writing (October, 1913) they are beginning to look sick and, while trypanosomes cannot be demonstrated in the blood, it is possible they may yet appear.

IV. *Summary:* This is the second reported instance of human trypanosomiasis observed in the United States. As in the first case, the disease was not contracted in this country, but in Africa. Our patient was seen during a relapse, when he presented practically the same symptoms as in his initial attack. The most pronounced symptom was depression, which was in marked contrast to the euphoric state present for a time after the administration of salvarsan. It is interesting that three of the signs most commonly present were absent in this case, namely, autoagglutination of the red blood cells, circinate erythema, and deep hyperæsthesia (Kerandel's sign). The findings on examination of the blood, cerebro-spinal fluid, and gland juice, as confirmed by the results of animal inoculation, are in accord with the observations of Todd and others as to the relative value of these diagnostic methods. The case is instructive in that treatment for nineteen weeks in the early stage of the infection sufficed to render the patient practically, or entirely, free from symptoms referable to the disease over a period of three years, but at the end of that time there was a relapse.

Digitized by Google

As to the effect of therapy, our own experience was unfortunately too brief to be of any value, but the improvement apparent after a single dose of salvarsan was very striking. The man was not believed to be a menace to the community, owing to the absence of the transferring agent, the tsetse fly. Many investigators have attempted to convey the disease from animal to animal by the agency of other biting flies, but without success. The possibility of merely mechanical transference of the trypanosomes by mosquitoes was considered remote, as this would involve interrupted feeding and immediate passage of the insect from the patient to an uninfected person, since experiments have shown that, when an interval elapses between bites, infection in this way does not occur. The fact that trypanosomes could not be demonstrated in the patient's blood, even by inoculation of susceptible animals, made us feel that the danger from this source was minimal. Practically, the experience with imported cases elsewhere has shown that the disease is self-limited in the absence of the intermediate host.

References.

1. Chagas: Memorias do Instituto Oswald Cruz, 1909, i, fasc. 2, 159.
2. Guérin: Thèse, Paris, 1869.
3. Camac: Am. Jour. Med. Sc., 1911, cxlii, 658. Tr. Assn. Am. Phys., 1911, xxvi, 246.
4. Manson: Ann. Trop. Med. and Parasit., 1908, ii, 46.
5. Kerandel: Bull. Soc. de path. exot., 1910, Nov., 642.

Discussion.

Report of a Case of Trypanosomiasis. (Dr. J. A. Chatard and Dr. C. G. Guthrie, Baltimore.)

Dr. Creighton Wellman, New Orleans: It is possible that the method of cultivation of malarial parasites *in vitro* worked out by Bass may be applicable to the human trypanosomes. Doctor Johns, of the Tulane School of Tropical Medicine, has succeeded in cultivating the trypanosomes of certain animals by a modified technic and has followed the development forms in a medium containing proteid.

Dr. John M. Swan, Rochester, New York: It seems likely that the beginning of the infection in this patient may be detected in the attack of fever followed by the papular eruption, which occurred just after the battle between the Europeans and the natives. This exanthem would correspond pretty closely to the eruption described in the books as being one of the early manifestations of trypanosomiasis.

Dr. Edward Stitt, Washington: It is a well-known fact that perfectly well people can have trypanosomes in their peripheral blood without showing evidences of infection.

Digitized by Google

INFLUENCE OF WATER-BORNE DISEASE ON THE MORTALITY OF CHILDREN.

By ALLAN J. McLAUGHLIN, M. D.,
Surgeon U. S. Public Health Service.

The principal water-borne diseases are typhoid fever, Asiatic cholera, and dysentery. Certain diarrheas of obscure etiology, which have been called "winter cholera," "ptomain poisoning," etc., etc., are also very often water-borne. When the water supply of a city or town is polluted by sewage any and all of these diseases may be prevalent in children. The influence of these diseases upon child mortality is difficult to estimate for two reasons; first, intestinal diseases in children are very often atypical and frequently are unrecognized; second, children may present frank symptoms of cholera, typhoid, or dysentery, apparently due to contact or milk infection, but which was indirectly due to water.

Atypical Cases. The frequency of atypical cases of cholera in children was demonstrated in the writer's experience in the Philippines.*

The predominant symptoms in the fatal cases investigated were not those of cholera, but cerebral manifestations were common, resulting in diagnoses of meningitis and convulsions. Many of the milder cases would be unrecognized unless chance bacteriologic examination of the stools discloses the cholera vibrio.

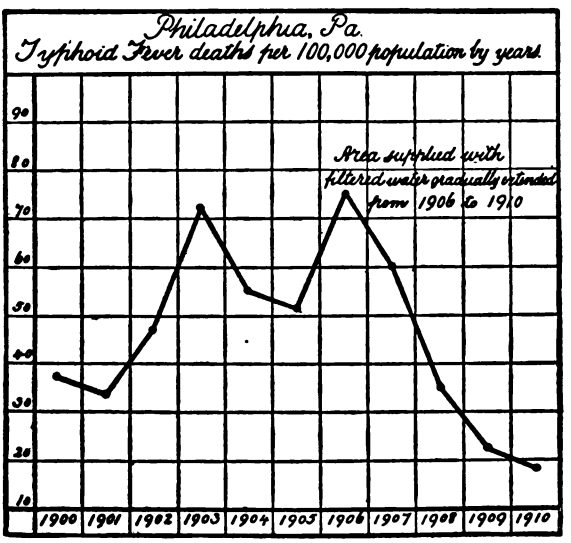
In our own country physicians have had the same experience with typhoid fever. If we expect to make our diagnosis in children by the presence of rose spots, diarrhea, or any of the other classical symptoms of typhoid, we may overlook many atypical cases which fail to present these symptoms. The solution lies in bacteriologic examination of the blood and excretions in all sick children with indefinite symptoms.

*McLaughlin, Allan J. Some observations upon cholera in children. *Philippine Journal of Science*, Oct. 1909, page 363.

Digitized by Google

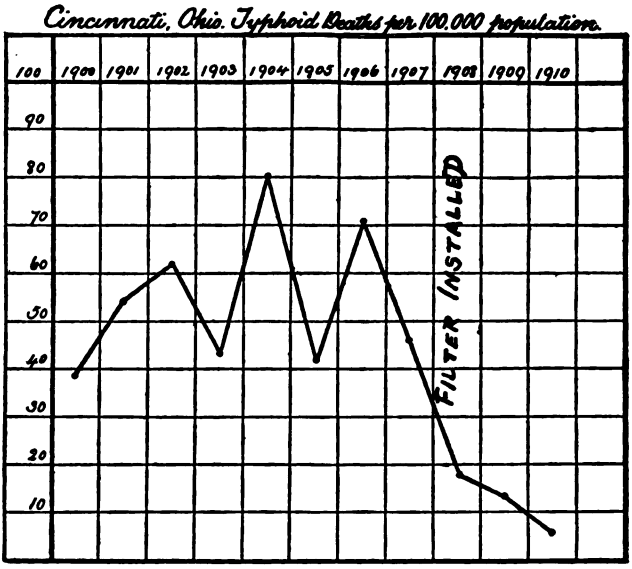
Cases Indirectly Due to Water. Frank cases of cholera, typhoid, or dysentery may apparently be due to contact, flies or milk, and yet indirectly, at least, be due to polluted water. Polluted water is often used to dilute milk or to wash milk cans or bottles. Water-borne typhoid establishes foci of the disease from which contact cases are derived. The incidence of water-borne typhoid fever, for example, can be estimated by the reduction in the total typhoid rate effected by substituting a pure for a polluted water supply. This reduction is not confined to the adult population, but a marked reduction in the typhoid incidence is also effected.

The old idea that typhoid fever was not a disease of childhood had no basis of fact, but was strengthened by comparative rarity of typical and the frequency of atypical cases in children. The writer has made an investigation of the effect of sewage-polluted water supplies on infant mortality* and his results show that a grossly polluted water supply is usually coincident with an excessive infant mortality, and that this infant mortality is especially high in the winter and spring months.



*McLaughlin, Allan J. Sewage polluted water supplies in relation to infant mortality. Reprint from Public Health Report No. 77.

Digitized by Google



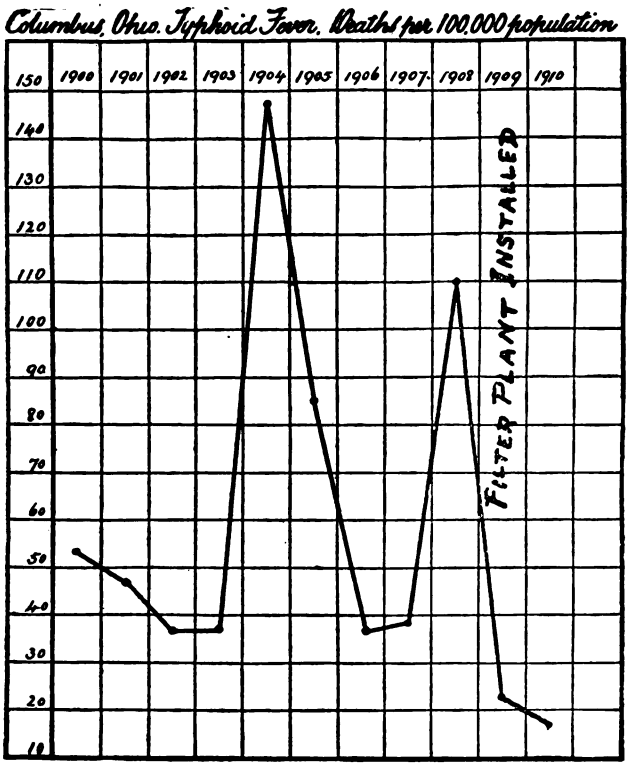
The incidence of water-borne disease in children of school age coming between the two classes, adults and infants, is probably higher than generally supposed. The following charts show the reduction in typhoid fever effected by substituting a safe for a polluted water supply.

Philadelphia gradually extended the area receiving filtered water from 1906 to 1910. Note the coincident reduction in the typhoid fever rate. Cincinnati, Ohio, installed a filter plant in 1907. Note the reduction beginning immediately thereafter and culminating in 1910 with a rate of only 8.8. Pittsburg, notorious for years as a typhoid center, began furnishing filtered water to a portion of the city in November, 1907. Note the enormous reduction coincident with the increase in the filtered water area. Escanaba, Mich., had probably the worst typhoid fever history among the smaller cities with the possible exception of Niagara Falls. A filter plant was installed in 1910. A prompt and permanent reduction was effected.

Niagara Falls' record for typhoid is particularly reprehensible in view of the fact that hundreds of thousands of tourists visited that city every year. The average typhoid fever rate

Digitized by Google

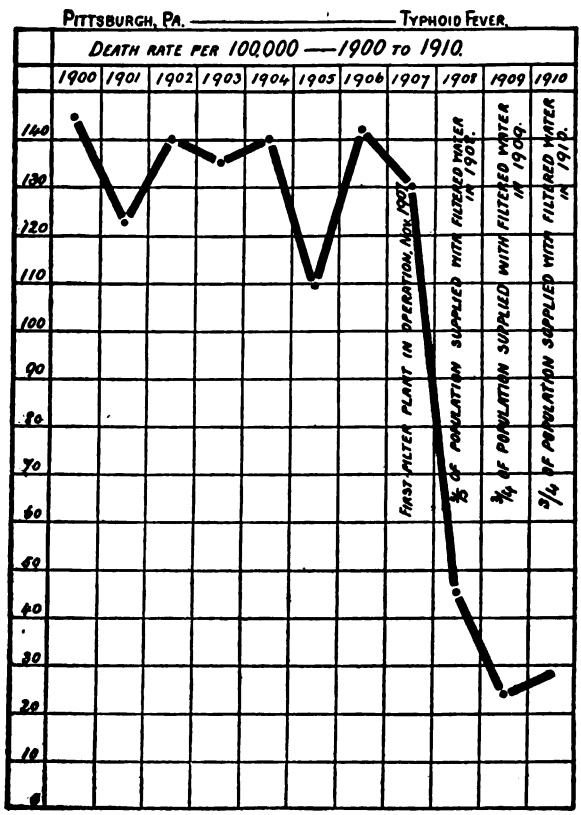
in Niagara Falls for twelve years, 1900-1911, was 124 typhoid deaths per 100,000 population. Filtered water was supplied to the entire city in April, 1912. Typhoid deaths in May were due to infection prior to April. Reduction in typhoid deaths would be epected to be evident in June. In June there were no deaths from typhoid fever, and the rate for the first year, June 1, 1912, to July 1, 1913, was thirty.



Hundreds of other instances might be cited, but these examples should suffice to show the enormous effect of water-borne diseases on our mortality and morbidity statistics.

These so-called water-borne diseases are transmitted by many other agencies than water, so that in addition to preaching the gospel of pure water in eradicating diseases such as typhoid and dysentery, we must attempt to check the spread of these

Digitized by Google



diseases by milk, flies, and dirty fingers. There is no general field for the spread of hygienic education so promising as the public schools. It is often a fruitless endeavor and always a difficult task to convince adults that certain simple hygienic measures will prevent disease. On the other hand, the receptive mind of the child quickly accepts these principles and eagerly applies them to every-day life. The influence of a good teacher in moulding the plastic mind of a child is nowhere more beautifully illustrated than in the teaching of simple hygiene applied to the prevention of disease. The success achieved in the Philippines in suppressing cholera epidemics in recent years was due in no small measure to the teaching in the public schools of simple rules for its prevention.

Digitized by Google

The children taught their parents simple personal and family hygiene, and with greater success than could have been achieved by any health officer.

Children should be taught the following:

1. That it is the plain duty of municipalities to furnish safe water 365 days in the year.

2. That it is their inalienable right to demand and receive such water.

3. That water cannot be assumed to be safe unless shown to be safe by a daily bacteriologic examination.

4. That the necessity for daily bacteriologic control of water supplies applies to filtered as well as unfiltered surface supplies.

In addition to teaching the necessity for safe water supplies, other measures for the prevention of the so-called water-borne diseases should be advocated to cut down the infections due to contact or dirty fingers.

The gospel preached to the children in regard to food infection should be simple and need not involve more than two primary facts:

1. Contamination of food or drink by careless fingers may be equivalent to homicide.

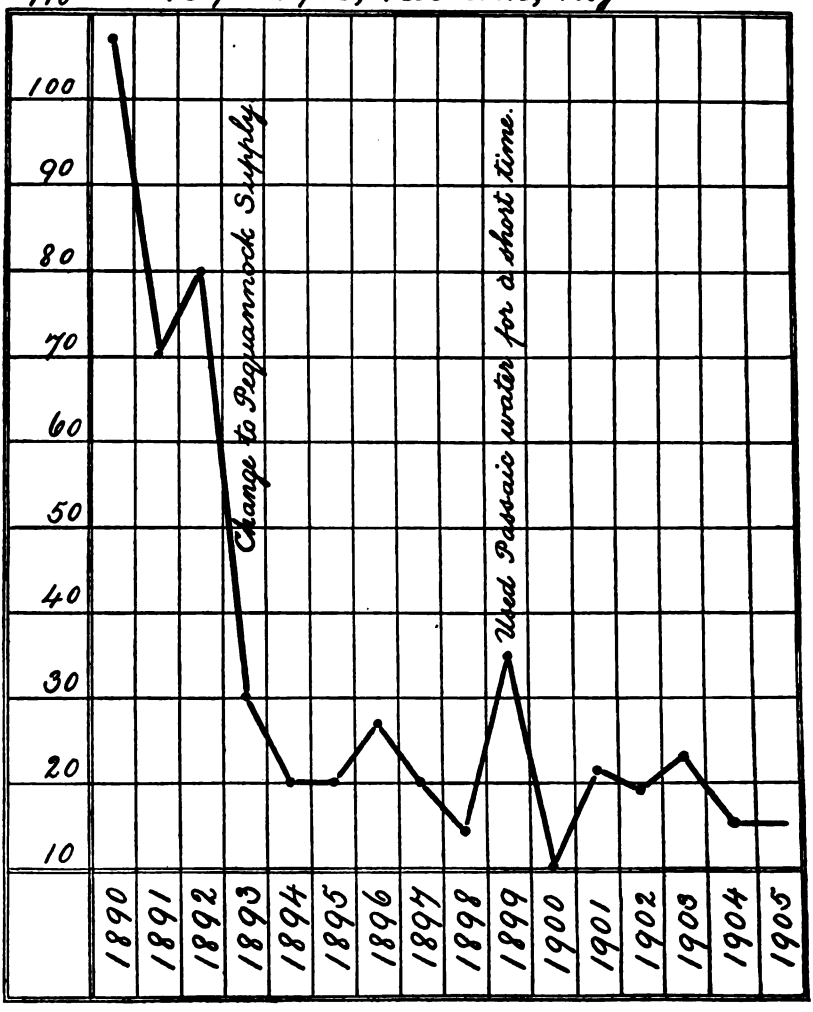
2. Such dire results can be avoided by careful cleansing of hands and finger nails after using the toilet and before handling food and drink.

This simple instruction should be general. More intensive and complicated instruction should be given only by professional nurses and physicians where actual cases of illness exist in the proper care and disinfection of human excreta.

Such a campaign of education would not only reduce the typhoid fever prevalence, but would be followed by a decrease in bacillary dysentery and in the group of entities commonly classified as diarrhea and "enteritis of children."

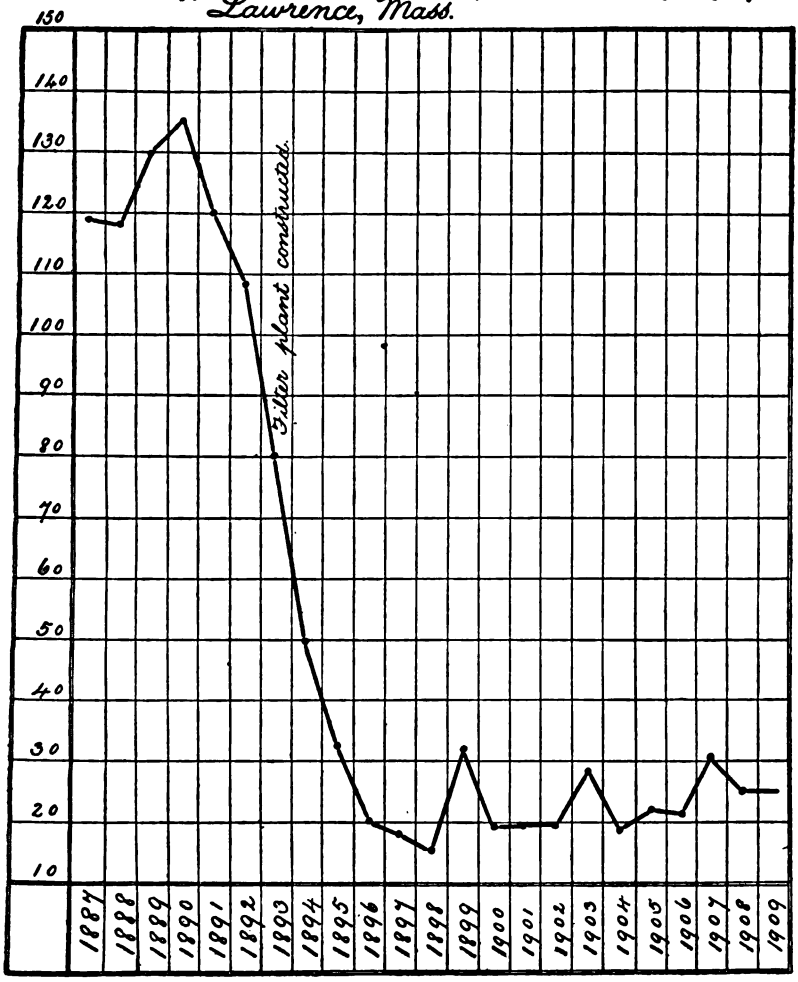
Digitized by Google

Chart I Typhoid fever Deaths per 100.000, 1890–1905, Newark, N.J.



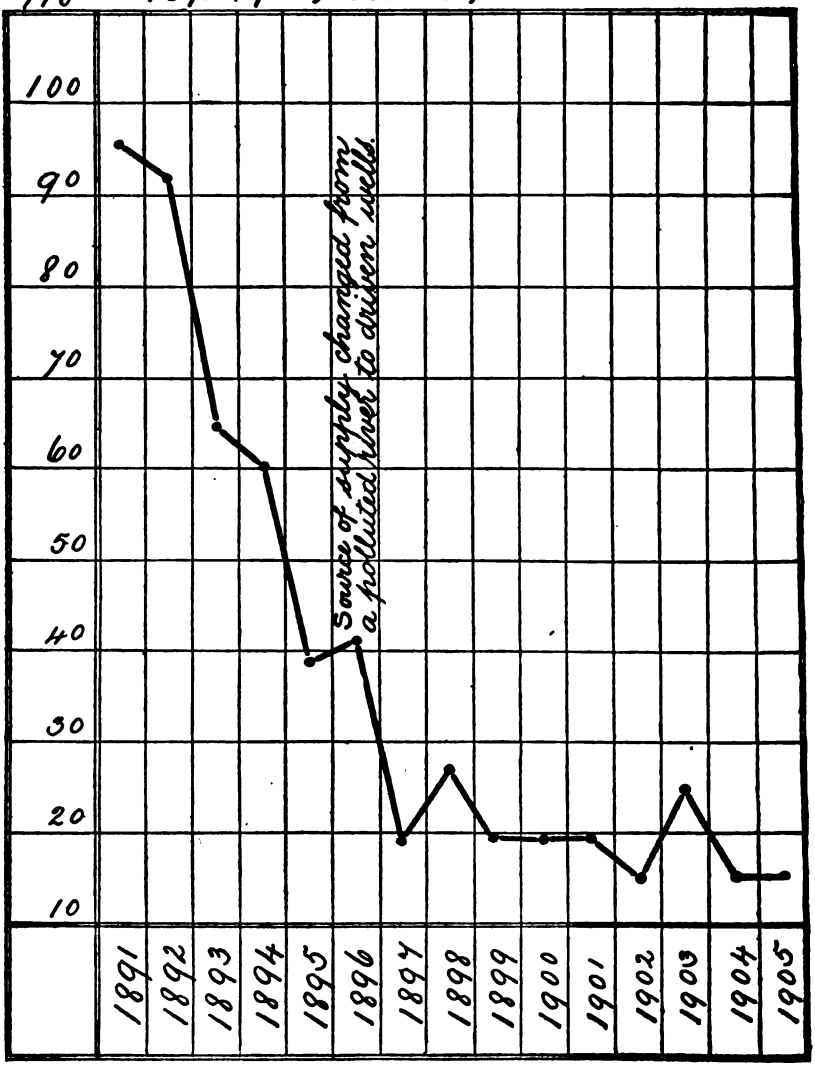
Digitized by Google

Chart II Typhoid Fever Deaths per 100.000, 1887–1909, Lawrence, Mass.



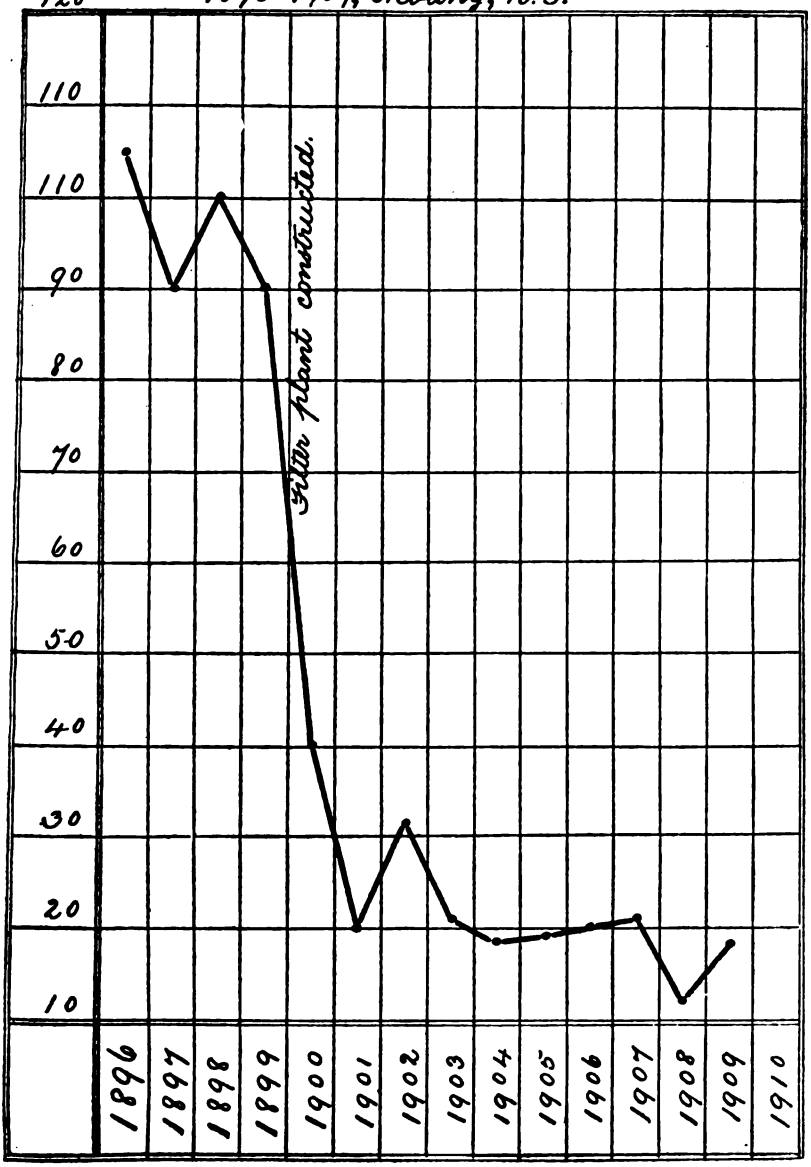
Digitized by Google

Chart III Typhoid Fever Deaths per 100.000, 1891–1905, Lowell, Mass.



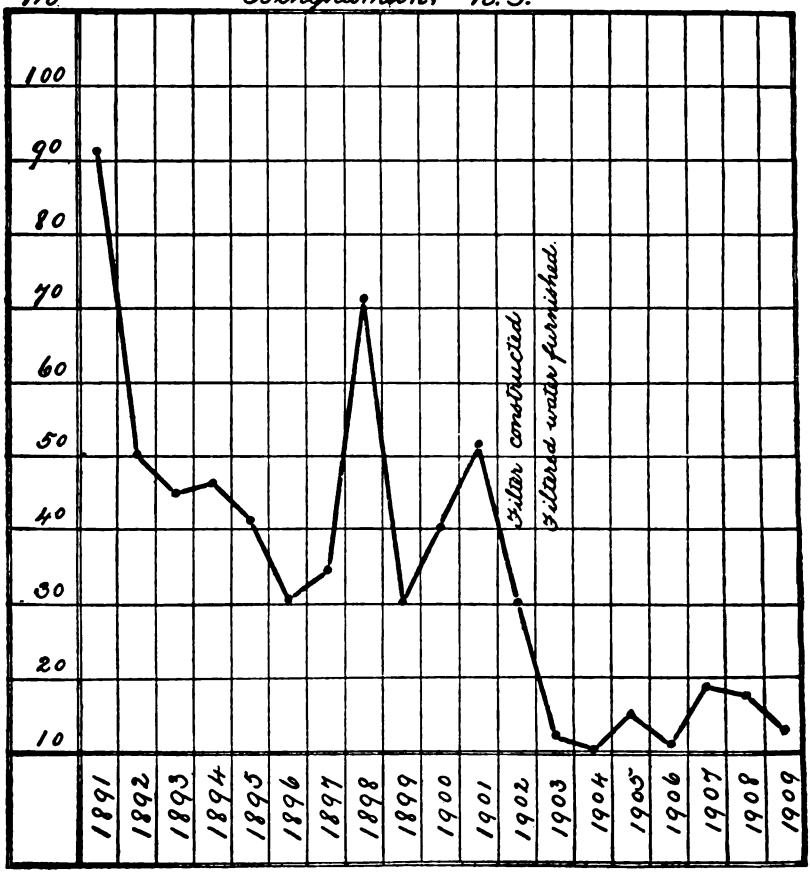
Digitized by Google

Chart IV Typhoid Fever Deaths per. 100.000
1896–1909, Albany, N.Y.



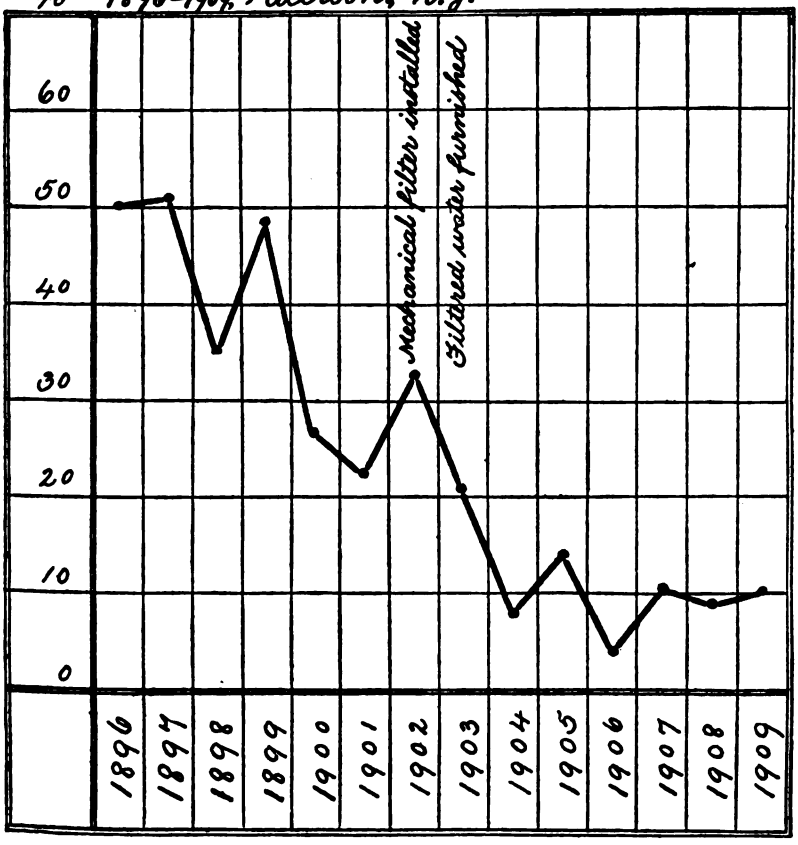
Digitized by Google

Chart V Typhoid Fever Deaths per 100.000, 1891–1909
Binghamton, N.Y.



Digitized by Google

Chart VI Typhoid Fever Deaths per 100.000
1896-1909 Paterson, N. J.



Digitized by Google

THE OUTLOOK FOR DEMENTIA PRECOX: THE PLAINTIFF'S PLEA.

By BAYARD HOLMES, M. D., Chicago.

Since the institutions for the insane were opened to receive the mental and physical wrecks of civilized society, the dement has been the most contemned and neglected inmate of the madhouse. He curls up in bed, filthy, starving, neglected, to die of bed sores or tuberculosis. With the expenditure of fifty mlilions a year for the custody of 186,000 insane in 400 "hospitals" of the continental United States, not $5,000 a year has been expended by any state in rational research for cure or prevention.

There has lately been a great advance in diagnosis which ought to change the whole attitude of the public and professional mind toward dementia precox. This disease, which never gets well, has been looked upon by our ancestors as a curse of God or as the machination of the Devil. Our immediate associates in psychiatry who cure acne by the interpretation of dreams,* have declared that dementia precox was the result of a "twisted idea" and that all research into the physical conditions of the 15,000 youths who enter our insane asylums every year never to come out, would be an act more irrational than the systematized delusion of an old paranoiac. The "twisted idea" was supported in the arguments of most psychiatrists by an nereditary psycheathenic basis.

In spite of the pessimistic attitude of the phallic-worshipping majority of the keepers of the insane, some rational psychiatrists in Germany, where the neo-phallicism of Freud originated, have made the startling discovery that dementia precox can be objectively diagnosed from the other insanities and from health by a biochemical method. It has come about through the application of Abderhalden's defensive ferment reaction to psychiatry.

When any gland or organ in the human body degenerates from any cause there is aroused in that body or person a defensive ferment which is capable of peptonizing the detached albu-

*See December, 1913, number of Abnormal Psychology, Vol. 8, p. 308, line 15-20.

Digitized by Google

mins of that gland or organ and thus excreting through the kidneys the products of degeneration. Now the test depends upon the fact that the blood contains the ferment which can do this peptonizing just as well in the dialysing test tube as in the body.

When Fauser, of Stuttgart, examined the insane by this method, he discovered that the manic-depressive group showed no sign of a degenerative process in any organ; but, on the other hand, the dementia precox group showed a degenerative process or "dysfunction" of the testicle, if male, and of the ovary, if female. During the past year there has been great activity among German psychiatrists in the application of this method to diagnosis, and dementia precox has been definitely removed from the domain of mysticism and dream-mongering magic to mechanistic science and rational philosophy. This largest group of the asylum population now become material for mechanistic, chemical, physical and biological laboratory study.

At the same time the growing conviction that dementia precox is *not entirely hopeless of cure* has been strengthened by the reports of Halver Lundvall, of Lund, Sweden, and Julius Donath of Budapesth. Each of these authors and clinicians reports the cure of 30 per cent. or more of their patients by a protracted artificial hyperleucocytosis. Their reports read like fairy tales, too good to be true. Their methods, though originating independently, are alike in motive and resemble each other in materia medica.

Lundvall injects subcutaneously into the patient, whose blood has been examined and has shown a polycythemia and leucopenia, two to twenty cubic centimeters of a solution made up of the following:

Nucleate of soda	100.00
Arsenious acid	0.05
Hetol (Merck.)	10.00
Distilled water	400.00

This is a saturated solution; it must be kept in a cool, dark place and sterilized before being used. The syringe should be filled with the hot solution and given warm. The chill, hyperthermia and hyperleucocytosis follow in a few hours.

Digitized by Google

The doses should be repeated as soon as the leucocytosis has subsided, which lasts several days after the temperature (102 to 104 degrees) resulting from the injection has become normal. The injections produce little pain and no abscesses. They should be continued over a long time. Anaphylaxis does not appear.

Probably 60 per cent. of the inmates of our insane asylums are cases of dementia precox. A growing increment of the crimes and misdemeanors of adolescents is due to the early symptoms of this disease, the diagnosis of which is no longer a matter of expert opinion, but of a positive laboratory demonstration. It is passing strange the inertia and supercilious pessimism of the keepers of our insane, that they will allow no physical research in the psychopathic institutes such as those at New York, Ann Arbor and Kankakee. In a field so dark, and one that involves the very existence of 15,000 youths each year, every clue should be followed, every promising remedy pursued to its very end.

All improvement must come from without the institution builders and bedlam keepers. The building of prison-like mad-houses is irrational, extravagant and cruel. Custody without research is a monstrous atrocity committed upon the helpless insane and their disheartened and confused friends. Argentina, Belgium, France and British Columbia have shown better ways, but our business-managed state charities run in the rut of the 1850's.

Hospitals we have by act of legislature, but they are lunatic asylums and mad-houses the same as before their names were changed. Hospitals they are in name, but prisons in architecture and in fact. And so they will be and so they must be until research dominates custody and optimistic endeavor to cure supplans supercilious and pessimistic inertia.

Bibliography.

The Abderhalden defensive ferment reaction was first published in May, 1912, and the first work done in psychiatry was published on the last day of that year. Emil Abderhalden's new book, "Abwehrfermente des tierischen Organismus," was published in December, 1913, and contains a very full, but by no means complete, bibliography of the subject, up to November 1st, 1913. The American and English contributions have not been very large or numerous and very few articles have appeared

Digitized by Google

on this reaction in psychiatry. My own article in the Lancet Clinic, Jan. 17, 1913, pp. 71-76, contains the references to some important papers. Ralph W. Webster, in the forthcoming edition of "Diagnostic Method" (P. Blackeston, Philadelphia) will also give a bibliography up to 1914. At least six or eight laboratories at the insane asylums of Germany are engaged in this work already, but none, so far as the medical press witnesses, in the United States or Canada. Readers who have the Münchener Medizinische Wochenschrift can find the best of the articles in its columns, but the most comprehensive single article, especially as it relates to dementia precox, is that of Urstein of Warsaw, who was well prepared for this work by his clerical studies, especially by "Die Dementia precox und ihre stellung zum Manisch-depressiven Irresrin (Vienna, 1909, pp. 372).

Digitized by Google

REPORT OF A CASE OF LONG-STANDING AMEBIC ABSCESS OF LIVER AND LUNG.

Cured by the Intramuscular Injection of Emetine Hydrochloride.

By ALLAN EUSTIS, B. S., Ph. B., M. D.,
Assistant Professor of Dietetics and Nutrition, College of Medicine, Tulane University, New Orleans.

A. B. D.: White male, 35, native of Louisiana, sugar chemist. First seen by me January 21, 1913, when he consulted me for constant cough associated with a profuse sanguino-purulent expectoration, fever, chills, sweats and emaciation.

Family History: No history of any tuberculosis, cancer or rheumatism and negative in every respect.

Previous History: He had the usual diseases of childhood, but was never severely ill until May, 1910, when he was ill in Porto Rico for ten days with a mild dysentery, passing in his stools much mucus, but no pus or blood. He had frequent attacks of what he considered diarrhea with abdominal pains, but with only three or four stools a day; no pus, mucus or blood. He returned to New Orleans about September, 1910, and was treated by Dr. S. with salol-coated ipcac pills with relief of symptoms, so that he was able to return to work in Porto Rico in January, 1911. He was well for one month and a half after returning to Porto Rico, at which time he again began to have attacks of diarrhea every two weeks. He returned to Louisiana in July, 1911, and about October, 1911, he began to have chills with sweats, pain in the region of the liver and in the right shoulder, while his bowels were alternately constipated or diarrheal in character. He was treated by various physicians from October, 1911, to August, 1912, and frequent aspirations of his liver were made, but no pus was ever withdrawn. In August, 1912, he went to St. Mary's Hospital, Rochester, Minn., where about four ounces of clear fluid was aspirated from his right pleural cavity, but no pus was located. In September, 1912, he developed a cough and expectorated blood-tinged mucus.

Digitized by Google

A few nights later he coughed up a large quantity (6 oz.) of pus mixed with dark-colored blood. He developed septicemia and had become so emaciated that operative interference was not deemed advisable. In two more weeks after coughing up great quantities of pus, a large abscess was finally located in the liver, which was incised with escape of probably a pint of thick pus. He finally recovered from the septicemia and his fever became lower, while free drainage from the liver wound was continued.

On account of the severity of the winters he concluded to return to his home in Loreauville, La. He improved for a short while, but as drainage from the liver was lessened by closure of the wound, he began to cough more and manifest symptoms of a pyogenic toxemia, when he came to New Orleans and was referred to me by Dr. Wellman.

Physical Examination, January 21, 1913: Small, emaciated, anemic individual, with all the earmarks of a long-standing septic infection. Right lung retracted at apex, and small amount of fluid in the right pleural cavity. An area about 8 cm. in diameter can be located at base of right lung posteriorly on a line with the tip of the scapula, over which can be heard gurgling rales and bronchophony with flatness on percussion. When the patient lies on his left side, which provokes severe coughing and expectoration of quantities of thick sanguino-purulent pus of a light brown color, the area of dullness is not changed and the breathing is continuous in character. Left lung is apparently normal.

Heart: Somewhat dilated and heart sounds feeble, but no murmur audible.

Temperature: 102½ F., pulse 112, respiration 24, systolic blood pressure 118 (Tycos).

Liver: Enlarged and tender on palpation, liver dullness measures 13 cm. in mammary line. There is a scar six inches in length in the mid-axillary line between the eighth and ninth ribs. In the center of the scar is a sinus in which there is a one-eighth-inch rubber tube about one and one-half inches long, which he states he has had great difficulty in retaining. The

Digitized by Google

pus escaping through this tube is almost identical in microscopic appearance with that coughed up. All other organs are normal.

Blood Examination, January 22, 1913: Hemoglobin 70 per cent. (Talquist Scale), red blood cells 3,660,000, white blood cells 11,687, neutrophiles 75 per cent., large mononuclears 11 per cent., small mononuclears (lymphocytes) 12 per cent., eosinophiles 1 per cent., basophiles 1 per cent.

Urine: Specific gravity 1,030, acid, negative for glucose, albumin, urobilinogen, acetone, diacetic acid and bile pigments; strong reaction for indican. No organized sediment on microscopical examination.

Microscopical Examination of Liver Pus obtained from scrapings of the walls of the sinus revealed numerous motile amebæ with ingested red blood corpuscles, and with all the characteristics of *Entameba histolytica*

Microscopical Examination of Sputum: Negative for tubercle bacilli. A bacillus morphologically similar to *Bacillus coli communis* and numerous pus cells, red blood cells; large cells similar to degenerated liver cells. January 23, 1913, specimens of stool and freshly expectorated pus were examined and the same type of amebæ found as in the pus from the liver sinus. January 25, 1913, the sinus in his side was incised, about 6 cm. of the eighth rib was removed and an abscess cavity about 8 cm. in his liver freely exposed by Dr. H. B. Gessner. The cavity was packed with gauze soaked in balsam of Peru. Free drainage from the liver was established, but he still continued to cough up large quantities of pus whenever he assumed the recumbent posture. He was kept under observation for two months, but with only slight improvement, and was allowed to return home with very little hope of recovery.

News received from him at various intervals pointed to progressive decline, and both Dr. Gessner and I had given up all hope of his recovery, when in May, 1913, I sent twelve ampules of emetine hydrochloride to his family physician, Dr. Guy Shaw, with instructions to administer one ampule (1-3 gr.) twice a day, intramuscularly, which was done, the patient receiving in all four grains. He recently passed through New Orleans during my absence, when he visited Dr. Gessner, who states

Digitized by Google

that he was robust and strong. All discharge from the liver had ceased, with complete healing of the wound. There was no more cough, nor diarrhea, and the patient was on his way to Porto Rico to resume his work as sugar chemist. He stated to Dr. Gessner that after the third injection of the emetine his cough had ceased to bother him, and that he felt like a well man even two or three days before the final injection was given. He has gained thirty pounds, there are no intestinal symptoms and apparently he is a well man.

This case is reported in detail as it shows the truly remarkable effect of emetine hydrochloride on the amebæ. The results of this case would warrant one in using the remedy after drainage of all amebic abscesses; and knowing the effect of the drug upon this particular organism, there is reason to expect that its administration will shorten the convalescence of all similar cases.

I wish to acknowledge thanks to Messrs. Parke-Davis & Co., who furnished me gratuitously the amples of emetine hydrochloride for experimental purposes.

Digitized by Google

NEWS AND COMMENT

Owing to the abundance of rats and the consequent danger of plague in the harbor towns of the Dutch East Indies, constant vigilance on the part of the authorities is necessary. A mixture of petroleum and soap, applied freely to the rat-infested parts, has been found by Dr. Pijl, government physician for the harbor of Soerabaja, to be highly efficient in destroying the fleas and plague bacilli. This method is both cheaper and more effective than that of carbolic acid.

Dr. James F. Leys, formerly of the Colon Hospital, Cristobal, C. Z., is now at the Naval Station, Newport, R. I.

Surgeon-General George Henry Torney died on December 27th at his home in Washington after a short illness from bronchopneumonia. Dr. Torney served in the navy from 1871 until his resignation in 1875. He was then appointed in the army, rising from the rank of assistant surgeon to that of Surgeon-General of the Army in January, 1909. Dr. Torney, during his service, did duty both in Cuba and the Philippines.

The National Conference on Race Betterment was held in Battle Creek, Mich., on January 8-12, 1914. The sessions were held at the Battle Creek Sanitarium, where a most interesting program was given.

At the Panama Exposition to be held in San Francisco in 1915, special attention will be given medicine and surgery. The methods used by Colonel W. C. Gorgas and his men for the sanitation of the Canal Zone, the eradication of mosquitoes and the stamping out of malaria and other deadly tropical fevers, will be a special feature.

A teacher of hygiene will be employed in the public schools by the Atchison (Kansas) Board of Health. The teacher, a

Digitized by Google

trained nurse, will hold classes in hygiene for the teachers of the staff and will make regular examinations of the school children.

The Iowa State Board of Health announces a plan for the investigation of the sanitary condition of the state, including an inspection of public water supplies, sewage disposal plants and means of garbage disposal.

A state laboratory of hygiene will be established in West Virginia in connection with the School of Medicine of the University of West Virginia. Study and prevention of contagious diseases, examinations made free for physicians and health officers of suspected cases of tuberculosis, typhoid fever, etc., and the chemical and bacteriological examination of milk and water will be special features of the laboratory. Vaccines will be prepared in the laboratory, and research work and classes in public health will be conducted.

The tenth session of the Australasian Medical Congress will be held in Auckland, February 9-14, 1914.

Contracts have been signed by the government of Ecuador for the cleaning up of Guyaquil, known as the "pest hole" of the Pacific. Several million dollars will be expended, and it is hoped that the result will be the eradication of yellow fever, plague, malaria and typhoid fever from this port. Many attempts have been made by the United States to compel Ecuador to improve the sanitary condition of this place, and the present success is largely attributed to the opening of the Panama Canal.

The appointment of Mr. F. C. Danson, J. P., as chairman of the Liverpool School of Tropical Medicine has been announced. Mr. Danson will succeed Sir William Lever.

Surgeon E. L. Munson, U. S. A., who has already succeeded in introducing the dispensary system into the interior of the Moro Province, and who has done much toward the establishment of friendly relations between the Moros and the United States, has been appointed chief health officer of the Moro Province.

Digitized by Google

CURRENT LITERATURE

Pellagra: A Summary of the First Progress Report of he Thompson-McFadden Pellagra Commission.—(*J. A. M. A.*, Vol. LXII, No. 1, Jan. 3, 1914.) A brief summary relating to the history of the inception of this commission is given by its members, J. F. Siler, M. D., Captain Medical Corps, U. S. Army; P. E. Garrison, M. D., Passed Assistant Surgeon, U. S. Navy, and W. J. MacNeal, M. D., Assistant Director of Laboratories, New York Post-Graduate Medical School. The rest of the article is devoted to various findings, both in the field in Spartanburg County, S. C., and in the laboratories of the New York Post-Graduate School. The investigation in the field brought out several facts: 1, The preponderance of the disease in the city of Spartanburg over the rest of the ten townships in the county; 2, the density of population showed no tendency to conform to prevalence of the disease; 3, the tendency to center in the cotton mill districts rather than in the rural districts; 4, the white race gives a greater number per 10,000 than the negro race; 5, the adult females are more effected than the males, and of these the women employed in housework are more prone to the disease; 6, apparently no spring or fall recrudescence; 7, poor classes show higher percentage; 8, absence of properly consructed privies and screened houses lead to evidence of food contamination; 9, foods habitually used seemed to have no bearing. The commission found no evidence to support the theory of spoiled maize. Evidence seems to point to infection rather than to other sources of the disease. The essential points of the work of Mr. A. H. Jennings and Mr. W. V. King, of the Bureau of Entomology, U. S. Department of Agriculture, are brought out in regard to insect transmission, and stress is laid on *Stomoxys calcitrans* as a probable carrier, if it is carried by a blood-sucking insect. The chemical examinations showed several things: A lowered physiologic efficiency; anacidity with entire absence of pepsin or with pepsin in minute quantities seems to be common; a marked indicanuria, which was excessive in cases of gastric inefficiency; feces showed decidedly abnormal amounts of indol and skatol. Bacteriologic examinations with agglutination tests showed one strain to react more frequently with pellagrins than with others. The authors believe that insufficiency of food and other weakening factors, as childbirth, have a bearing on the predisposition to disease. In summarizing, they believe that the disease is not due to spoiled maize, but is a specific infectious disease, due to household contamination of food with excreta of pellagrins.

R. E. Graham.

Neurasthenia and Its Bearing on the Decay of Northern Peoples in India.—(Transactions of the Society of Tropical Medicine and Hygiene, Vol. VII, No. 1, Nov. 1913.) Sir R. Havelock Charles, in his address before

Digitized by Google

the above named society, selected as his subject a paramount question of to-day and future years: Is the white man suitable for or adaptable to the tropics? That which deserves primary consideration is his physical fitness and the innumerable maladies which quickly attack the unacclimated. Good health, a level head, and temperance are absolute requisites, before neurasthenia can possibly be avoided. Recalling the words of Cuvier, "The nervous system is at bottom the whole animal and the other systems are only to serve it." We must also take into account the abnormal effects produced by tropical light, heat, plus the humidity, with the resultant changes that lead to deterioration of the blood. Among predisposing factors to nerve weakness are heredity, emotional disturbances, infectious diseases, manner of living, alcohol, continued moist heat, imperfect metabolism, and the sun's rays. The symptomatology can be briefly classified into mental, emotional, circulatory and vasomotor disturbances and various anomalies of the gastro-enteric tract. The rectification of unsanitary conditions is possible and may later be effected, though this is merely a minor factor, for the atmospheric and climatic states, which play the major rôle, are irremedial. The paper was admirably discussed by some of the most distinguished members, including Sir Ronald Ross, Dr. Andrew Balfour, Major S. Lyle Cummins, etc. P. L. Querens.

Elephantiasis of Scrotum.—(*China Medical Journal*, No. 6, Vol. XXCII, pp. 388-390, Nov. 1913.) Owing to the scant amount of literature on the surgical treatment of this condition, Adrian S. Taylor has devised a new method which is radical and has been found applicable to the cases as encountered by him in the Yangchow clinic. It is simple, very comprehensive, and warmly welcomed, for details of surgical interference are wanting in the textbooks of tropical medicine. The article is illustrated with three figures. P. L. Querens.

Some Notes on Syphilis Among the Chinese.—(*China Medical Journal*, No. 6, Vol. XXVII, pp. 379, 386, Nov. 1913.) James L. Maxwell calls attention to the ignorance of the world at large concerning the prevalence of syphilis in China; he even censures the inaccuracy of current statements that it is met in only a milder form, with practically no tertiary lesions existing. Hereditary syphilis is very common, and is also mistaken for the acquired types of children, infection resulting from the breasts, household articles, etc. In the acquired type, of course, infection via the genitalia predominates. The primary sore usually resembles the Hunterian type of chancre, but may be a mere erosion that easily escapes notice, or may even be intraurethral. Also phagedenic ulceration occasionally exists due to mixed infection, which is not considered at all rare. The secondary symptoms are quite similar to those of the western hemisphere, but the cutaneous eruptions are often more severe. Joint symptoms are quite common, also iritis, and even deafness resulting from affections of the auditory nerve. Vascular and bone affections are very common, but the author comments

Digitized by Google

upon the infrequency of aneurysms in Formosa and South China. Visceral syphilis—debarring eye diseases, which are common—the author considers rare. Of the parasyphilitic diseases, general paralysis has been found to be extremely rare, while tabes dorsalis, though not to be considered as common, is occasionally encountered. The author requests correction of the statement made at the meeting of the Royal Society of Medicine that the Chinese and Japanese have acquired immunity against this malady by its continued presence amongst them for centuries. Deducting conclusions from his experience with the Japanese in Formosa, they exhibit very severe forms, especially those of the osseous system, which is anything but mild. Of course the possibility exists that they acquired the disease from Chinese women in Formosa, who probably harbor a more virulent type of organism than that encountered in Japan. P. L. Querens.

Typhus on Ships.—(*Archiv fur Schiffs-und Tropen-Hygiene*, Bd. 17, Heft 23, by Government Councilors.) Dr. Markl makes preliminary remarks about the prevalence of endemic foci in Ireland, Russia, Tunis, Algeria, Egypt and Mexico, while being practically extinct in Central Europe. The disease which in the days of sailing vessels with poor hygienic conditions was carried from port to port, and which went under the name of "ship's typhus," is practically unknown to the modern steamers. His attention was drawn to it by an obscure fatal case in a girl presenting the symptoms of septic infection. She belonged to the fugitives from Saloniki following the disturbances of the Balkan wars, and had been interned with a number of smallpox suspects at the Marine Hospital of Triest. The author's tentative diagnosis of typhus at that time was not considered, since no cases had occurred either in the locality from which the girl came or in the Balkan provinces. Later, however, a certain diagnosis was made among fugitives from Bornio, one of which had been interned in the hospital for fourteen days. A further description is given of a ship's epidemic on board the steamer "Vorwörts" of the Austrian Lloyd during the months of May and June, 1913. The steamer was in transport service, and had taken some 2,000 troops and officers, besides additional crew, for Constantinople. The troops were in poor physical condition, and after the embarkation at Constantinople the vessel returned to Triest, proceeding farther to Fiume. At this place there were found to be eighteen cases on board, and these were entirely among members of the old crew. They presented symptoms of general malaise, chills, headache, anorexia, and in some cases, vomiting. The majority had fever and herpes. Two were found with splenic tumor. In only four cases could an exanthem be found, none of which could be considered that of typhus. Later twenty persons of the crew, which had been mustered out at the Triest arsenal, developed the disease. The epidemic must have originated from cases among the troops, and the author points out that change of clothing during the incubation period in the clothing house, which corresponds to the findings of Nicoll, is a preventive measure. He concludes the article with a description of the symptoms and

Digitized by Google

of his experiments. The disease was ushered in with fever similar to typhoid, with euphoria, at first sleeplessness or sleep with vivid dreams. The exanthem appeared on the fourth day, with roseola on the breast and abdomen, spreading to the whole body and becoming petechial on the extensor surfaces. Death occurred about the fourteenth day in collapse. His animal experiments were negative. Complement deviation seemed to be established. The granules of Prowozek found in the polynuclear leucocytes in the Belgrade epidemic were present. Blood cultures remained steril. The assertion of Comptes and Nicolle that serum of persons infected with typhus would agglutinate *M. melitensis* could not be verified. Mortality was 15 per cent. L. C. Scott.

Parasitic Thyroiditis.—(*Revista de Bacteriologia é Hygiene*, No. 19, 1913.) Dr. Felix Veintemillas describes a disease fully established by Dr. Carlos Chagas, of the Oswald Cruz Institute of Rio de Janeiro, that was frequently encountered in the state of Minas Geraes in Brazil. Chagas carried on his investigations so thoroughly that the new disease has a well-marked course, its infective agent is described, and the intermediate host is known. The disease is caused by a flagellated bacterium, which at first was called *Trypanosoma cruzi Chagas* (Archiv für Schiffs-und Tropen-Hygiene), but which was later differentiated as a new genus, and called *Schizotripanum cruzi*. This protozoön was found during the examination of the intestinal contents of a blood-sucking hemipterous insect, which is commonly known in Brazil under the names of *barbeiro fincao, chupao, bicho de parede*, according to its different habitats. Biologically, this common insect belongs to the family of *reduvidos*, genus *conorrhinus*, species *megistus*. It lives in the houses of the poor, in the dark corners of the houses, untidy places, chicken-roosts, etc., appearing usually at night, when the lights are put out, and feeding on the blood of men and animals, by which means the infection is propagated. It hides during the daytime and flees when a light is brought near it at night. Its puncture is not painful enough to awaken a sleeper. It easily invades new places, and promptly abandons uninhabited dwellings to go in search of others that are occupied, where it may find fresh food, for it lives by haematophagy. The *Conorrhinus megistus* generally deposits from eight to twelve eggs at each laying, sometimes as many as forty-five. In all, one insect may lay as many as 200 eggs. The larva at birth is reddish; in eight hours it is dark grey. It begins to suck blood from five to eight days after hatching out. It sheds its skin several times, the first time in forty-five days, the second in two or three months, and the third in from four to six months. For these moultings to take place, it is always necessary for the insect to feed on blood. At about the fourth moulting the nymphal period begins, taking place usually in about 190 days, when the insect feeds abundantly, and secreting, before puncturing, an acrid, colorless liquid, having a distinct alkaline reaction. It remains in the nymphal state for forty-five days, to enter then upon the fifth moulting and become an adult insect. All of the

Digitized by Google

organs undergo great modification, except the eyes, which remain black. The time required for the insect to develop into an imago is not less than 260 days. It transmits the infection in the three stages of larva, nympha, and imago. The conorrhinus becomes hungriest and is most eager to draw blood when the temperature is high; below 14 degrees C. it feeds very little. Dr. Arthur Neiva, of the same institute, has examined specimens of an insect called *Vinchucas*, sent to him from neighboring countries in the south and east, where they sometimes amount to a plague. He identifies the *vinchuca* as the *Triatoma infestans* (Klug), and regards it as a probable carrier of hemoflagellate of Chagas. Chagas produced the disease experimentally in the parrot, guinea pig, rabbit and dog. After he had found the conorrhinus in the blood of infected animals, Chagas proceeded to examine the blood of persons living in the houses infested with the conorrhinus. He quickly found a trypanosome (now called *Schizotrypanum cruzi*) in the peripheral blood of children. He correlated his discovery with an endemic disease in those localities, which the natives called *opilacao* and *canguari*. He also then examined the peripheral blood of persons in a dwelling infested with the conorrhinus and found the same parasite. From his observations Chagas draws the following conclusions, though not absolutely: First, a certain but undetermined proportion of the conorrhinus gathered in the dwellings of infested districts are infecting for vertebrates; second, the larvæ sent to the laboratory and fed on contaminated animals, the peripheral blood of which presents numerous parasites, do not always become infecting, in spite of the fact that the midgut contains flagellated organisms; third, the larvæ which, in such cases, do become infecting, become so only about eight or ten days after the ingestion of infected blood, and remain infecting for a long, though undetermined, period; fourth, the punctures of larvæ two or three days after the ingestion of flagellated organisms are not infecting to vertebrates. The parasites multiply in the intestinal contents, remaining alive a long time, and being sometimes formed in the excrement. The exact course of development of the parasite is unknown; but, inasmuch as it has been isolated in the cavities of the insect, it is very probable that its stay in the body is brief and that the organism is on its way to the salivary glands. When the contents of these glands are examined in the fresh state, flagellated organisms are found in active motion. The schizotrypanosoma, as found in the peripheral circulation, presents two phases, an intraglobular and an extraglobular. The intraglobular phase occurs in the beginning of the infection. The microscopical diagnosis of the disease is very simple in acute cases. When a drop of fresh blood is examined, a multitude of flagellated parasites are found. The gravity of the case varies with the number of the parasites. In chronic cases it is necessary to centrifugate the blood, or even to inoculate a guinea pig with some of the suspected blood. Clinically, parasitic thyroiditis in human beings presents two forms, acute and chronic. In the acute form there are cases in which nervous symptoms predominate, simu-

Digitized by Google

lating meningo-encephalitis. These cases are almost always fatal. The acute form is found chiefly in infancy, mostly in the first year of life. The acute attack lasts from ten to thirty days, ending either in death or passing into chronic form. The symptomatology of the acute form absolutely differentiates the disease from all other diseases. The pathognomonic symptoms are the following: Continued fever, with the presence of flagellated organisms in the peripheral blood; the face swollen, and with a characteristic expression; constant hypertrophy of the thyroid gland; crepitating sensation on pinching the skin of the face, showing that there is infiltration of the subcutaneous tissue with mucoid substance; generalized enlargement of the lymphatic glands, especially in the neck; enlargement of the liver is never absent, and the spleen also is sometimes enlarged. The chronic cases are divided into the following varieties: First, pseudo myxedematous form; second, myxedematous form; third, cardiac form; fourth, nervous form; fifth, chronic forms with acute exacerbations. A. McShane.

Digitized by Google

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed.

TRANSACTIONS.

Transactions of the Fifteenth International Congress on Hygiene and Demography, Washington, September 23-28, 1912. Published by the Committee on Organization. Edited by the Secretary General. Washington: Government Printing Office. 1913.

Volumes II, III and IV of these Transactions are to hand, and are here mentioned. Volumes I, V and VI are to follow and will be reviewed later. A glance at the tables of contents reveals the monumental character of the proceedings. It were invidious to choose among the multitude of papers presented, but the readers of this Journal will probably be most interested in Volume II, Part I, and Volume IV, Part I. In the first mentioned, among the papers read before the Section of Hygienic Microbiology are a number of special importance to students of tropical diseases. Some of these are: Natural and Induced Immunity to Typhus Fever, Drs. John F. Anderson and Joseph Goldberger; Ueber Choleraelektivnährböden, Prof. Adolf Dieudonné; Egg-agar as Culture Medium for Cholera Spirilla, Dr. Charles Krumwiede, Jr.; Special Culture Media for Pure Culture of Amebae found in the Intestines of Animals, Dr. Anna W. Williams; Cultivation of Malarial Plasmodia in Vitro, Dr. C. C. Bass; A Critical Review of the Bacteriology of Human Leprosy (With special reference to the Chromogenic and Nonchromogenic Acid-fast Strains), Dr. Charles W. Duval; The Relation of Parasitic Amebae to Disease, Capt. Charles F. Craig; The Identification of the Pathogenic Entameba of Panama, Dr. S. T. Darling; List of Parasitic Amebae, arranged alphabetically, Howard Crawley; Der Kernaufbau der Parasitischen Amöben, Dr. M. F. S. von Prowazek; Compendium of all Amebae, Arranged According to Their Hosts, Regardless of the Zoological Status of the Species of Amebae, Albert Hassall; Bibliography of Parasitic Amebae, Albert Hassall; Genera and Species of Ameba, Dr. Gary N. Calkins; The Cultivation of Amebae, Dr. Gary N. Calkins; Anaphylactic Reaction in Pellagra Patients by the Inoculation of Watery Extract of Spoiled Maize, Guido Volpino. In the Fourth Volume (Part I), dealing with the proceedings of the Section on Control of Infectious Diseases, several other papers are distinctly interesting to tropical workers, e. g. How the Campaign Against Yellow Fever Has Been Carried on in the Mexican Republic, Dr. Eduardo Liceàga; The Part Played by Flies and Other Insects in the Spread of Infectious Diseases in the Tropics, with Special Reference to Ants and to the Transmission of Tr. Hippicum by Musca Domestica, Dr. Samuel T. Darling; Mouches et autres insectes por-

Digitized by Google

teurs de maladies infectieuses—Rapports entre les microorganismes et les insectes qui leur servent d'hôtes, Prof. Félix Mesnil. Among other significant contributions mention should be made of the symposium on *Amoebae*, which includes a series of most valuable systematic papers and bibliographies. Creighton Wellman.

Proceedings of the Third Meeting of the General Malaria Committee Held at Madras. Simla: Government Central Branch Press. 1913. 289 pages.

This elaborate report contains, besides the proceedings and general addresses of the meeting, forty scientific papers on malaria and related subjects. The president's address covers in a broad way not only the malaria situation, but also many other problems of disease control in India. Among those presenting papers and sharing discussions are the well-known names of Celi, Bentley, MacGilchrist, Donovan, Patton and others. Lack of space precludes any extended notice of the individual papers, many of them of great value, but following are some of the most importants points brought out during the meeting: E. C. Hodgson reported that complete sets of all the known Indian *Anopheles* had been obtained and duplicate sets sent out to enable officers to examine specimens thoroughly without danger to the type specimens. J. H. Horne stated that a study of the health of the Madras Presidency had been begun by graphing the total mortality figures and a critical examination of seasonal swings and spidemic rises. Major Fry reported on malaria in Bengal and showed that the disease is endemic but not universal throughout the Ganges delta. T. G. N. Stokes, from a study of malaria in the Central Provinces, concludes that endemic malaria there increases the death rates by about 10 per mille per annum. Hodgson spoke on the malarial survey of the New Imperial Delhi and states that the malaria rate showed a very definite rise in April and May, which are not rainy months, indicating that zygotes mature only in definite temperature. E. L. Perry spoke on the endemic malaria of the Jeypore Agency Estate, Madras Presidency, and brought out the point that this estate was an example of the benefit of clearance of jungle. Bentley introduced "a new conception regarding malaria." After distinguishing between malarial infection and malarial disease, he concludes that the occurrence of the disease in epidemic form is always the result of a serious change in environment by which conditions formerly favorable to life have become unfavorable. The same observer read a second paper on problems presented by malaria in Bengal. He concludes that the lapse of cultivation is the great factor involved and that general improvement in agriculture would be more effcacious than direct attacks upon the disease. J. D. Graham spoke on mosquitoes in the United Provinces and recommended extended observation over a series of successive years in fixed localities. R. K. C. B. Bahadur discussed the breeding of mosquitoes and mentioned that they breed better in old than in new earthen vessels. J. R. Adie read an inquiry into malaria and mosquitoes in the Kashmir Valley and J. C. Robertson a

Digitized by Google

note on the relation between seasonal birth and death curves. A. C. MacGilchrist presented an elaborate and valuable paper on the hemolytic action of quinine and its salts with suggestions regarding the etiology and treatment of blackwater fever. He concludes that *in vitro* the acid salts of quinine are powerful hemolytic agents, the neutral salts are slightly hemolytic and the alkaloid quinine itself is not only non-hemolytic but even delays autolysis. *In vivo* an acid mixture of quinine is precluded from causing hemolysis by the concentration of the blood as compared with the suspension used *in vitro*, by the presence of the serum, by the neutralizing effect of the plasma and by the defensive action of the organism, exercised particularly through the liver whenever there is danger from the presence of foreign acids in the blood. He points out that the most striking symptoms of blackwater fever are exactly those of acidosis or acid poisoning. MacGilchrist also contributed a paper on the pharmocological action and uses of quinine. Papers on Quinine Propaganda, by Bentley, and School Quinization, by J. D. Graham, were also read. In a study of latent malaria H. W. Acton and R. Knowles propose a new classification of the various phases of latency. J. A. Turner discussed malaria prevention measures in Bombay and Major Graham, anti-malarial operations in the United Provinces. A series of papers on *Stegomyia* next followed. Liston and Akula introduced the subject of *Stegomyia* and allied species of mosquitoes in Bombay; Dr. Mhaskar dealt with *Stegomyia* mosquitoes in Karachi; MacGilchrist discussed a *Stegomyia* survey in Calcutta; J. H. Horne read a paper on *Stegomyia* mosquitoes in Madras; Major Lalor reported on a *Stegomyia* survey in Burma, and Professor Howlett presented a leaflet on the yellow fever mosquito and a study of insect psychology. Major Lalor also read a paper on the etiological relationship of seven-day fever in which he suggested that *S. fasciata* may turn out to be the carrier of this disease. A report was made by Bannerman on kala-azar, and Patton discussed possible animal carriers of the disease in India. He decides that in Madras at least it is of human origin. This latter author also described the development of the parasite of kala-azar in the bed bug and concludes that this insect is the vector. Captain Cragg likewise read a paper on kala-azar and F. P. Mackie a progress report on the same disease, which was also the subject of papers by V. T. Korke, T. C. McCombie and R. K. C. B. Bahadur, who believes it is a form of malaria. One paper by F. P. Mackie on the investigation of protozoal diseases and another on the body louse as a disease carrier closed the scientific proceedings of the meeting of this important committee, the report of which should be read in full by every worker interested in the problems presented by the presence of malaria in the tropics.

Creighton Wellman.

Digitized by Google

BOOKS.

Beriberi. By Edward B. Vedder, A. M., M. D. William Wood and Company, New York. 1913.

As the author states in his preface, there is no book in the English language on beriberi of a later date than Braddon's (1907), and in view of this fact alone it would seem that there was need of just such a book on account of the vast amount of research along these lines which has been carried on in the past few years. However, it is unfortunate that the author should have completed his work before it was shown that highly milled rice is not the only cause of polyneuritis gallinarum, as one is struck by the evident biased opinion of the writer in this respect. The work is excellently written and is of deep interest, showing conclusively that highly milled rice when fed exclusively to fowls will result in a form of paralysis, called polyneuritis gallinarum, but the work of Wellman and Bass in the School of Tropical Medicine of Tulane University (*American Journal of Tropical Diseases and Preventive Medicine*, 1913, Vol. 1, No. 2, p. 129) proves that the same condition is produced by a diet composed exclusively of many other substances, viz.: Sago, grits, cream of wheat, etc. For this reason the book is apt to excite an unwarranted aversion to polished rice, while later work being done in this same laboratory would tend to prove that polyneuritis gallinarum and beriberi are not identical pathological conditions, the former being a degeneration of the nerves and the latter a true neuritis, with proliferation. The chapters on the distribution of the disease, pathology and symptomatology are especially well written and the text is amply assisted by numerous photographs showing patients with both wet and dry types of the disease, and also microphotographs showing changes in the heart muscle and liver, but in this portion of the book none of the peripheral nerves or cord are shown, although they are the principal organs involved. The greater portion of the book is devoted to a consideration of highly milled or polished rice as an etiological factor, and the phtographs of animals in various stages of paralysis are interesting and instructive. He reviews in detail, in the appendix, Andrews' experiments in an attempt to prove that beriberi can be transmitted from a woman to puppies, and while the puppies developed weakness and edema, it is to be noted that they all contained lumbricoids or hookworms. The bibliography at the end is the most complete in the English language, while the index both to authors and subjects is complete and well arranged. The book will be welcomed by the medical profession as a means of obtaining the results of the recent research work on polyneuritis gallinarum, but is apt to have a decided influence in moulding unwarranted public prejudice against polished rice.

Allan C. Eustis.

Digitized by Google

Protein Split Products in Relation to Immunity and Diseases, by Victor C. Vaughan, Victor C. Vaughan, Jr., and J. Walter Vaughan. Lea & Febiger, Philadelphia, 1913.

The results of a lifetime of research are to be found in this volume, and when one considers that the senior author was the first to call attention to proteid poisons and cellular toxins, it is not surprising that the volume has already met with universal approbation. While dealing with technical terms, it is very readable and will prove of interest to even one with a limited knowledge of chemistry. Our preconceived ideas regarding bacteria are upset and one is at first astonished to find that these organisms are protein or animal and not vegetable, and that they are capable of building up their own body proteins from amino acids in the same way as do higher animals. A clear explanation of the phenomena of immunity, of anaplylaxis and of vaccine therapy will be found in its pages. All statements are corroborated by ample experimental evidence and can be accepted as scientific facts. The pages of this little book should be carefully read by every practitioner before he attempts serum or vaccine therapy. Allan Eustis.

Annual Report of the Bureau of Health for the Philippine Islands for the Fiscal Year July 1, 1912, to June 30, 1913. Victor G. Heiser, M. D., Director of Health, Surgeon U. S. P. H. S. Bureau of Printing, Manila, 1913.

The vast amount of work undertaken by the Philippine Bureau of Health can only be glimpsed by the survey of this report. There are detailed the various functions of the bureau from true sanitary supervision to actual investigation of all phases of disease, hygiene and food. The hospital situation is discussed, the water supplies noticed, the unsanitary attributes of various communities detailed. Aside from the excellent work done by the Public Health Service, there has been active investigation of tropical diseases by the Army Board.

Since 1906 a total of 7,546 lepers have been isolated in the Philippine Islands; during the year of the report 848 were collected. There is now voluntary admission to the leper asylums by many inmates. Cebu is the chief nidus for new cases, supplying about one-half.

Various treatments have been essayed, including vaccine, but the only cases apparently cured were treated with chaulmoogra oil.

Pellagra is either unknown or so rare as to have escaped notice. Plague has broken out in various localities, but has never gotten away from control.

Sprue, yaws and beriberi are noted and a rather full account of typhoid incidence is given. Altogether the report is interesting as showing first the amount of work already accomplished and the sanitary aspect of the islands, and, second, the enormous possibilities of future work.

Dyer.

Digitized by Google

United Fruit Company, Medical Department: Annual Reports for 1912 and 1913. Press of Geo. H. Ellis Co., Boston, 1913.

The interest in these reports must go beyond the commercial tributaries of the United Fruit Company, for, aside from the direct value of a thoroughly organized medical service related to the business of this concern, there is an immediate value in public service, sanitation and epidemiologic importance attaching to the statistical tableaux presented. More than this, all students of preventive medicine, as well as of tropical medicine, must find a direct field for study in reports which so amply deal with features of tropical medicine in practically all its phases as shown under the most favorable conditions for investigation.

The study of the Central American countries and of the islands in the Gulf of Mexico from the viewpoint of systematic investigation of disease has hitherto been more or less incidental; hereafter the reports of the United Fruit Company will afford a basis for comparison as further investigation opens up.

The 1913 report is much more comprehensive than that of the previous year, and it contains a number of excellent photo cuts, showing the several hospitals and buildings in the medical service of the United Fruit Company. Not only has this service established a higher plane of health among the employees of the company, but the reports actually demonstrate that the mortality under hospital care of the sick is as low or lower than in more northern latitudes.

No detail has been spared in making up the comprehensive reports of the sick cared for, the sanitary work undertaken, nor the laboratory work conducted.

With groups of hospitals at seven or eight different localities, all equipped with full personnel of medical officers, nurses and working staffs, the example of what may be done in tropical sanitation and care of the sick is striking. Including the surgeons engaged on the ships between New Orleans, New York, Boston and other Atlantic ports in communication with the Gulf and Central American points, there are nearly fifty physicians under the administration of the service of the United Fruit Company. The hospitals are all practically new and erected for their purposes, and when the new hospitals at Quirigua (Guatemala) and at Santa Marta and Tela (Honduras) are completed, with provision for some 350 inmates in all, the efficiency of service will be notably advanced.

While those directing the affairs of the United Fruit Company may feel satisfied at the progress made in the medical provisions, they should deserve the profound appreciation of the medical profession for the demonstration of the possibilities in health regulation in the abused countries to the south of us, formerly condemned as pest-ridden. Dyer.

Digitized by Google

REPRINTS.

Charles, Sur.-Gen. Sir R. Havelock. Neurasthenia and Its Bearing on the Decay of Northern Peoples in India. Reprinted from the Transactions of the Society of Tropical Medicine and Hygiene, 1913, November, Vol. VII, No. 1, pp. 2-15.

Hill, David Spence. Notes on the Problems of Extreme Individual Differences in Children of the Public Schools. Department of Educational Research, New Orleans Public Schools, August, 1913.

Keen, W. W. Service of Missions to Science and Society. American Baptist Missionary Union, Boston, Mass.

Otis, Elmer F. Papers on Porto Rico. Reprinted from Journal of A. M. A., September 27, 1913, Vol. LXI, pp. 1031-1034. November 8, 1913, Vol. LXI, pp. 1683-1684.

Souchon, Edmond. Philosophical Anatomy of the Lungs. Reprinted from the New York Medical Journal, June 21, 1913.

Stanton, A. T. The Anopheles of Malaya. Part I. Reprinted from the Bulletin of Entomological Research, Vol. IV, September, 1913.

Walker, Ernest Linwood. Experimental Balantidiasis. Reprinted from the Philippine Journal of Science, Vol. VIII, No. 5, Sec. B, Tropical Medicine, October, 1913.

Wilbert, Martin I. and Motter, Murray Galt. Poisons and Habit-Forming Drugs. Reprint No. 146 from Public Health Reports, 1913.

PRINTED AT THE TULANE UNIVERSITY PRESS, NEW ORLEANS, U. S. A.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CHARLES CHASSAIGNAC, M. D.
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine
JOHN M. SWAN, M. D., Secretary, American Society of Tropical Medicine } *Ex officio.*
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M. D., University of Pennsylvania
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. FEBRUARY, 1914 NO. 8.

EDITORIAL

Announcement.—With this issue of The Journal and until the conclusion of the present volume the managing editors will conduct all other departments as well as the business of the publication. There will be no interruption in the monthly appearance of The Journal, nor in any other detail of its affairs.

This announcement is made because the former editor-in-chief has severed his relations with The Journal through purely personal reasons which in no way affect the management nor concern the enterprise directing the publication.

Contributors, subscribers, advertisers and other friends of The Journal are advised that it is the intention of the editors to continue the publication as the expression of American work along the lines already undertaken, with the assurance that there is a demand for this and that the men interested in tropical medicine and preventive medicine in America are desirous of an organ for the expression of their work.

Digitized by Google

The members of the American Society of Tropical Medicine are especially urged to remember that this is the official journal of the society and that contributions of all sorts will be welcome at all times, so long as they deal with matters of interest to the members, whether of a personal or a scientific character.

With the inauguration of this venture in a new field of medical journalism in this country, we declared it as our belief that the interest in tropical medicine would grow. The casual review of the literature of American medicine at this time will more than bear out that original confession of faith. The future promises more in the development of this branch of medicine. The position of the workers in the field will always be a matter of interest to this journal, as the pioneer in this particular phase of medical journalism, and we are concerned enough to wish to share in the expression of the outcome. The gradual development of educational centers for instruction in tropical diseases will bring more and more men into the investigation of such diseases and the coördination of interests can be served in a large way by us; we are also ready to undertake so friendly a task. In other words, The Journal is ready to coöperate in every way it may to coördinate the interests in tropical medicine in this country, and as a medium of expression for this purpose it has come to stay, incidentally, and also, appealing to the general reader through the natural interest in preventive medicine which must go as associated with tropical medicine.

We are, then, at your service.

Charles Chassaignac and Isadore Dyer.

Assurance of Life Tenure.—When life insurance companies first began operations they were more concerned in making money than with anything else. As time has gone on this has changed somewhat; now the life insurance company realizes that its business enters into many problems and questions of econom-

Digitized by Google

ics and of public health not hitherto considered. Each policyholder of to-day is either a silent partner in the mutual company, or else he is a valuable asset to the company insuring him.

Every safeguard is thrown around the company in the investigation of the person who applies for a policy, and the work of the statistician and the actuary has been so well done that there is every day less and less risk in the issuance of a policy. The examiner is better trained than he used to be, and even the soliciting agent takes fewer risks than formerly.

Once the risk is accepted, however, and the policy has been issued, there are new problems which arise so far as the company is concerned in relation to the individual insured.

Does the obligation of the insurance company end with the issuance of the policy? Is there any way by which the company may continue a relation to the insured which will maintain the status of the insured as a good risk?

Recently the life insurance companies have occupied themselves with the longevity of persons in different localities, with a view to drawing some estimate of the risks entailed in insuring persons living in such places. The deductions at times have been adverse to the locality because of the low mean age of death.

In the economical make-up of the insurance company this is only one of many phases which must arise within the consideration of the office, and the multiplication of legislation regulating life insurance can only add to the problems of administration.

The policyholder himself is really the one most concerned, for, after all, it is he who derives, indirectly, the chief benefit of the organization of life insurance, through the accumulations which accrue for his heirs. As a rule, the policyholder considers his obligation at an end when he has established his policy and has provided for the payment of the premiums as they fall due.

The growing active interest of life insurance companies in

Digitized by Google

public health questions of different sorts would indicate a desire or intention on the part of these companies to broaden their relation to the public at large, and particularly so far as their immediate interest in the policyholder is concerned. The better health of a community is the best safeguard of the insurance risk, so far as accidental disease is concerned, and this is almost as true when the consideration of general sanitation with reference to occupational diseases is undertaken.

The rare individual is careful of his teeth, perhaps of his general well-being, so far as regulating his habits are concerned, but it is almost a negligible quantity of the community which is careful enough to invite medical inspection, except in case of illness, present or threatening.

A recent bulletin of the Department of Health of New York City prints a paragraph devoted to the announcement of a corporation in that city originated under the title of "A Life Extension Institute," with the purpose of prolonging life by regular and systematic medical examination of its members.

Here is the opportunity for the life insurance companies.

Not only may such a feature be incorporated in the insurance policy offering such regular examinations, but such regular examinations might be required upon some basis of adjustment of premium dependent upon the continued good health of the insured.

The idea is not altogether new, for the tradition of the Chinese carries the suggestion that the physician's pay stops as soon as the client is sick!

There is one evident conclusion to be drawn from the discussion, which is that in the projection of preventive medicine much can be accomplished by a thorough study of the soil, and if regular medical examinations were sought by the public generally, more of prevention could be established than by having to wait for a large number of the same individuals to get sick.

Digitized by Google

Among the many suggestions for the attainment of old age, with health, some lack enough of trial to prevent their acceptance as more than theory, and with our intestinal flora antagonistic most of the time, if Metchnikoff is correct, and with our cells living to die faster than they can equilibrate, if Minot is correct, we have a large task to satisfy all of these and other theorists. It would seem a good plan, then, to take whatever human economy we may possess and to make the best of it by keeping the machinery in order, using the best mechanic we can find to take charge. *Isadore Dyer.*

The Hygiene of To-Day.—We are not yet sure of the limitations of the term hygiene. More than one definition has been employed, and still there is a broad possibility of changing interpretation of what is properly embraced in the consideration of all of those things which appertain to the welfare of the human race and the provisions for the preservation and continuance of the human kind.

Health is no longer the chief purpose of hygiene, but, depending entirely on the point of view, there are phases which deal with all the shades of human endeavor, from the consideration of community and of individual interests. Personal liberty is a thing of the past in matters of economics which touch others, and even the individual is bound to gather newer limitations of conduct and privilege as the scope of hygiene broadens.

The consideration of state medicine has, almost from the beginnings, been guided by a broad view of preventive medicine, viewing community and individual as natural charges of those qualified to govern the public generally, and as units in matters of health and well-being. As state medicine has broadened so as to regulate most things of hygienic importance, the details have multiplied so rapidly that even the present interest

Digitized by Google

of state bodies has not grasped the necessity for adequate provisions to meet the growing field.

The number of organized bodies, small and large, engaged in questions of hygiene in many of its branches, has consistently created public interest. This has required much education and a vast array of propaganda. Bureaus with sanitary functions have developed, and endowed laboratories for the investigation of municipal needs have come about, all of these aimed at studying the needs of hygiene in modern civilized life.

A systematic plan has not arrived, but with many workers engaged, the ideas are crystallizing and in due course of time a coördination will come.

The periodicals and the daily newspapers have had considerable part in the progress of education in hygiene, and even if this has not been organized, the very notice of a subject of such importance is apt to create some reflection in the minds of readers of the press. Sociologic questions once tabooed now find large space in current publications. No mawkish sentiments stand in the way of the full discussion of public morals, whether the subject relates to disease, vice or crime. The flood of sensational newspaper provender has done no harm for the morbid side; has only fed the appetites of readers who would have found some other means, while the educational side has reacted for a wholesome sense of responsibility in those willing to do public service.

The systematic work of the press in matters of hygiene, however, is only just beginning. A few papers and periodicals have organized editorial bureaus directed at hygienic questions; some deal elaborately with all matters of the sort, while others take only a few phases. But the field will grow to the point where the press, as the natural purveyors of certain sorts of education of the public, will be more than willing to take the proper means to spread exact information.

Digitized by Google

The whole subject of education in hygiene is one which cannot be segregated nor specialized; all classes are interested and all classes need instruction. Therefore it is obvious that all grades of advice must be devised.

This is indeed an age of sanitary advancement, and with the unrest over social problems in vice, the study of prevalent and epidemic disease, the array of evil practices in foods and drugs, the tangle of laws devoted to juvenile defection, the groups of questions involved in state and civic obligation in child welfare and in the protection of innocent persons in marriage contracts, together with an unnamed number of present and growing questions closely related, all make for a field for study in which many minds and much money may be well engaged.

Isadore Dyer.

Digitized by Google

ORIGINAL ARTICLES

CULTIVATION OF MALARIAL PLASMODIA IN VITRO.*

C. C. BASS, M. D.,
New Orleans.
(From the Laboratories of Clinical Medicine and Tropical Medicine, Tulane College of Medicine, New Orleans.)

Contents.

This paper consists of the following divisions:

1. Introductory remarks.
2. Efforts made to cultivate malarial plasmodia prior to the author's success.
3. Successful cultivation of malarial plasmodia by others employing the same technic and in confirmation of our work.
4. Cultivation of other red blood cell parasites by this technic.
5. Apparatus and materials required.
6. Technic for developing one generation only of parasites.
7. Technic for cultivating more than one generation of parasites.
8. Influence of dextrose in cultures.
9. Discussion of special features of the technic.
10. Description of developing parasites.
11. Some ideas relative to reproduction of malarial plasmodia *in vivo*, suggested by these observations.
12. Appreciation.
13. Bibliography.
14. Description of plates.
15. Illustrations.

Introductory Remarks.

In November, 1911 I[1] published the fact that I had successfully cultivated *Plasmodium vivax, P. falciparum*, and *P. malariae* in vitro. The technic was not given in detail largely because of the fact that it was, at that time, very imperfect and often unsuccessful. No further experimentation was done along this line on account of unavoidable circumstances until in April, 1912, when the Tulane School of Tropical Medicine equipped and sent a research party consisting of Dr. F. M. Johns and myself to the Canal Zone, where we could have at our disposal a

*Read at a meeting of the American Society of Tropical Medicine, May, 1913, Washington, D. C.
*Received for publication October 15, 1913.

Digitized by Google

large amount and variety of material, with the hope that we might be able to improve the technic. Our experiments led to the development of a technic which yields fairly uniform and satisfactory results. While in the Canal Zone we cultivated one or more generations of plasmodia from twenty-nine different cases of estivo-autumnal malaria and from six cases of tertian malaria. We published[2] a communication on the subject in October, 1912, giving the technic in detail, together with a brief discussion of certain observations made on plasmodia growing *in vitro*.

At that time we expressed the opinion that it was highly probable that the other blood cell parasites of man and animals could be cultivated by this same technic with such modifications as would be necessary to suit the particular case. In fact, in my early paper in 1911 the opinion was expressed that the technic then in the process of development would favor blood cultures of all sorts.

Specimens made from our original cultures in the Canal Zone and a complete set of the special apparatus employed in the cultivation were exhibited at the International Congress of Hygiene and Demography in Washington, September, 1912. The specimens were seen by hundreds of scientists from different parts of the world and recognized by all familiar with malarial plasmodia to be genuine and to represent every stage of the development of the parasite by schizogony.

During the few months since the technic was published our work has been confirmed and malarial plasmodia have been successfully cultivated by different workers in America, in England and in Germany. In addition to this, two other red blood cell parasites (*Piroplasma canis* and *P. bigemium*) have been cultivated by the same technic or slight modifications thereof.

Efforts Made to Cultivate Malarial Plasmodia Prior to the Author's Success.

Laveran[3] noted that malarial plasmodia were visible in hanging drop preparations for as long a period as ten days, but he was not certain that any multiplication took place, or in fact, that the parasites remained alive.

Digitized by Google

Coronado[4] claimed to have cultivated malarial plasmodia from infected water, but his work has not been confirmed. In a very large number of experiments bearing on this point we have found that when malarial plasmodia either directly from the blood or from cultures are placed in any non-isotonic fluid, such as water, they are killed almost instantly. It is not probable therefore that they could be cultivated from water when they are so promptly killed by the same fluid.

Miller[5] claimed to have cultivated the parasites. His experiments have been repeated but were not confirmed.

Sakharov, Rosenbach, Blumer, Hamburger and Mitchell[6] kept malarial plasmodia alive for several days in leeches that had been allowed to draw blood from malarial patients. Segmentation did not occur, but evidently some development did take place, for in the instance of Hamburger's experiments non-pigmented estivo-autumnal parasites developed pigment. However successful their cultures were, they are to be considered as having been accomplished *in vivo* instead of *in vitro*.

Numerous other attempts have been made to cultivate the malarial parasite ever since its discovery by Laveran but with uniformly negative results except for the instances just cited. These must also be considered negative from a practical standpoint at least.

Successful Cultivation of Malarial Plasmodia by Others Employing Our Technic.

So far as I know, the first in America to publish confirmation of our work was Lavinder.[7] He succeeded in cultivating one generation of *Plasmodium falciparum* from each of two cases of estivo-autumnal malaria, but failed to grow *Plasmodium malariae* in the one case of quartan malaria tried.

In the Canal Zone Carter and Thompson[8] cultivated *Plasmodium vivax* up to three-fourths their full size.

In England Thompson and McLelland[9] first published successful cultivation of *Plasmodium falciparum* in November, 1912. The only modification of our technic they made was to incubate the cultures at 38° C. instead of at 40° C. as I[1] had originally advised and as Johns[2] and I had later found to hasten the growth

Digitized by Google

of cultures so that they often grew more rapidly than they did in the body of man. The authors illustrated their article with drawings and photomicrographs, including photomicrographs of large accumulations of segmenting parasites. They considered these to be agglutinated plasmodia.

To this paper was added a note by Prof. Sir Ronald Ross in which he said he had examined their cultures and specimens and also specimens sent him by myself. He expressed the opinion that they represented every stage of development of the asexual cycle and that there was no doubt but that malarial plasmodia had finally been successfully cultivated.

Thompson and Thompson[10] cultivated one generation of *Plasmodium vivax* from each of two cases of tertian malaria. They employed an incubator temperature of 39° C. and noted as we[2] had before that the parasites sometimes grew even more rapidly than they did in the body of man.

Ziemann[12] studied a set of specimens from our cultures which we sent him and expressed the opinion that the parasites had been cultivated to the stage of segmentation.

Ziemann,[13] in Germany, succeeded in cultivating the benign tertian parasite from half to three-fourths grown parasites to complete segmentation.

In a personal communication H. Ziemann informed me that he has succeeded in cultivating the parasite of pernicious malaria by employing our technic.

Cultivation of Other Red Blood Cell Parasites by This Technic.

It was to be expected that whatever technic would permit the cultivation of malarial plasmodia would also suit for the cultivation of other red blood cell parasites, after, perhaps, any modification necessary to adapt it to the specific instance.

H. Ziemann* has succeeded in cultivating *Piroplasma canis* with slight modification of this technic. This organism resembles malarial plasmodia very much in its schizogony.

While experimenting on the cultivation of *Trypanosoma americanum* with this same technic Johns and I have noted development of *Piroplasma bigeminum* in the same culture with

*Personal communication.

Digitized by Google

the trypanosomes. Ordinarily the piroplasmata soon die out in cultures of *Trypanosoma americanum* or in defibrinated cow's blood.

Apparatus and Materials Required.

One generation of parasites may be grown with very simple technic, but they are destroyed soon after segmentation, and often just before, by the leucocytes in the blood from the patient. The apparatus needed for the cultivation of one generation only of parasites are the following:

1. Syringe and needle (Fig. 1, 1). An all-glass syringe, capacity 20 c. c. (or 10 c. c.), graduated, is convenient for this purpose. Syringes with rubber, leather or cotton plungers, washers, connections, etc., are not serviceable because they cannot be easily cleaned after being used, and when they are sterilized they give off substances which are harmful to malarial plasmodia. A coarse needle is necessary because strong force or strong suction so alters the cells (or parasites) that the parasites die in a short time. Such a needle is also desirable to avoid leaking and bubbling of air into the syringe and to facilitate taking blood into it and expelling it from the syringe.

2. Defibrinating tube (Fig. 1, 2). Tubes 2½ cm. in diameter and of whatever length will be accommodated by the centrifuge (if a centrifuge is to be used) are appropriate. This tube is plugged with a cotton plug having a plain glass rod (0.5 cm. diameter) running through it and extending to the bottom. A glass tube may be substituted for the glass rod, in which case the outer end is connected to a needle by means of a short rubber tube (Fig. 1, 3). More recently this rubber connection has been dispensed with and the needle (barrel without any shoulder) is welded into the tubing. Platinoiridium needles are necessary for this purpose. Blood is collected directly into the defibrinating tube by sticking the needle into a distended vein.

3. Culture tubes (Fig. 1, 4) not less than 1.25 cm. in diameter by 12.5 cm. deep.

4. Graduated pipette (Fig. 1, 10), 1 c. c. graduated in hundredths.

Digitized by Google

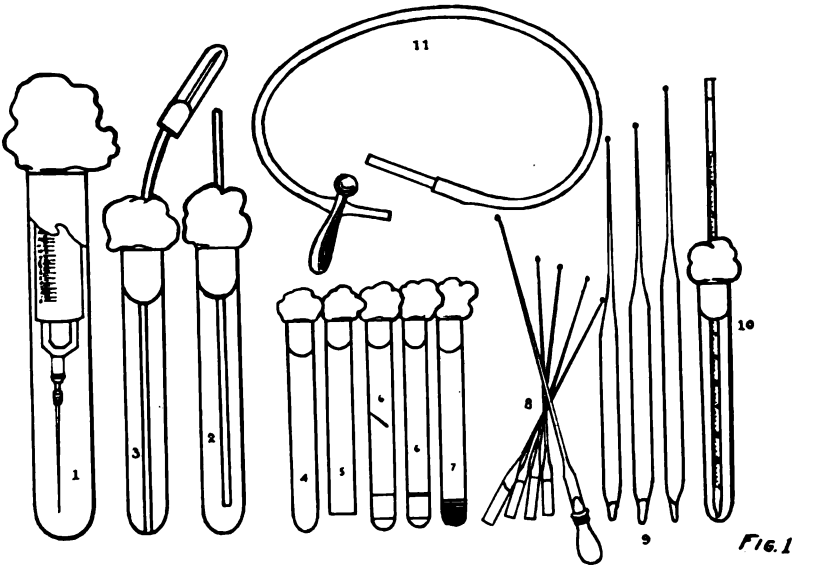


FIG. 1

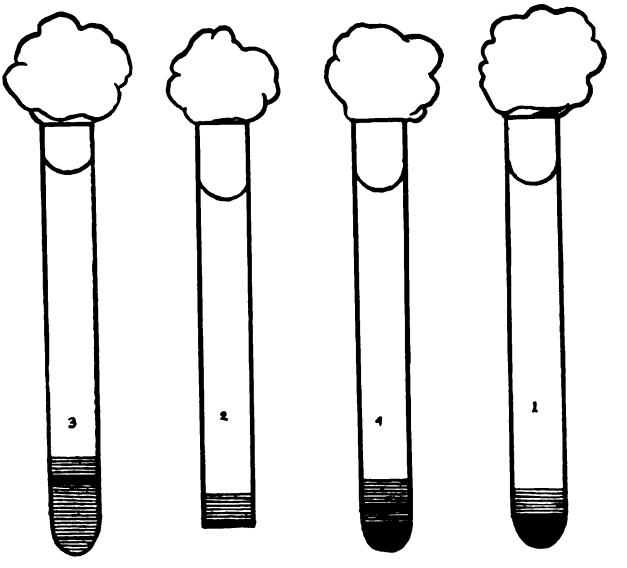


FIG. 2

Digitized by Google

Digitized by Google

5. Dextrose (Merck's) 50% solution in water. This should be sterilized at 100° C. on three consecutive days.

6. Capillary pipettes (Fig. 1, 8). Glass tubing 0.5 to 0.6 cm. in diameter is the proper size from which to make these pipettes. The capillary should be rather coarse since fine capillaries are destructive to malarial plasmodia. The large end of these pipettes should be plugged with cotton before sterilizing.

7. Rubber bulb (Fig. 1, 8). This should be of best quality and fit the pipettes well. The delicate uses to which the pipettes are placed require perfectly fitting bulbs.

8. Incubator regulated to a temperature of 40° C. It is possible to use an incubator running as low as 38° C., and in fact, often the parasites grow fairly well at 37° C.

The following apparatus will be required if more than one generation of parasites is to be grown, or if it is desired to avoid the dead parasites which are present in the deeper layers of cultures containing a thick column of cells.

9. Centrifuge, speed 800 to 2000 r. p. m. Higher speed centrifuges are likely to be destructive to the parasites or at least to cause such changes in the cells as to disfavor their growth.

10. Culture tubes 1.25 cm. by 12.5 cm., with flat bottom (Fig. 1, 5) or (Fig. 1, 6), with disk of pure white filter paper supported 1.25 cm. or more from the bottom of the tube by a piece of glass tubing. The latter should be cut straight across and should fit the culture tube fairly closely.

11. Plain pipettes (Fig. 1, 9), capacity 5 to 20 c. c. These pipettes should be plugged with cotton before sterilizing and the small end (large capillary) should remain hermetically sealed until it is to be used. They are not used a second time.

12. Rubber tube 50 cm. long, mouth piece and pinch cock (Fig. 1, 11). This tube should be of proper size to fit the neck of the large pipettes just described.

The syringes, tubes and pipettes must be sterilized in the dry sterilizer. A few drops of water in a tube in which blood containing plasmodia is placed will usually cause the death of the parasites. The dry sterilization must not be carried to the extent of scorching the cotton plugs, for the smoke that condenses

Digitized by Google

on the inner surfaces of the tubes is sufficient to kill all the parasites in a culture.

Technic for Cultivating One Generation Only of Parasites.

Blood is collected from the patient's vein at the bend of the elbow. If drawn with the syringe it is expelled directly into the defibrinating tube. The latter should be tilted to one side and care should be taken to avoid unnecessary exposure of the blood to the air. In either case, one-tenth of a cubic centimeter of the 50% solution of dextrose for each 10 centimeters of blood to be taken is placed in the defibrinating tube before the blood is drawn. Defibrination is effected by gently stirring or whipping with the rod or tube which extends through the cotton plug. The whipping in of air, causing bubbles, must be avoided. The plug and rod may now be replaced by a plug from another tube of the same size.

This defibrinated dextrose blood containing malarial plasmodia may be transferred to other tubes or incubated in the original tube. In any event the column of blood must be 2.5 to 5 cm. deep. This gives a column of serum 1.25 to 2.5 cm. deep above the cells and parasites when the latter have settled. Supernatant serum more than 2.5 cm. deep has no advantage. When this is less than 1.25 cm. deep the parasites often die before segmentation occurs. We have occasionally seen perfect segmentation, however, under 0.6 cm. of serum.

The parasites live and develop at the top of the column of precipitated cells in a layer varying in thickness from 0.05 to 0.1 cm. All parasites beneath this layer die in from two to twenty hours; the time depends upon factors which have not been determined. Some grow considerably before they die and we have occasionally seen small ring forms attain over half the full adult size in the deep part of the cell mass. When parasites die in these deep cells the central clear space in the small ring closes, or if the parasite is older the irregular projections, pseudopodia, are withdrawn. If pigment is present it loses its motility. The protoplasm gradually shrinks, losing its staining reaction, and finally only the nuclear chromatin granule remains. This also stains poorly. In the instance of very small parasites

Digitized by Google

often the red blood cell shows little or no evidence of the previous presence of the parasite. This suggests the possibility that the young parasite had not yet entered the cell substance.

The parasites in the thin layer at the top of the column of cells develop and may be examined at any time by drawing a small quantity of cells from this layer by means of a capillary pipette. Some considerable practice is required in order to do this without drawing cells and dead parasites from just beneath this layer. The pipette may be passed through a flame to sterilize it on the outside, but it must be allowed to cool thoroughly before it is used, since, in our experience, a temperature of 45° to 50° C. kills the parasites in a very short time.

Such a temperature also alters the red blood cells in some way so that they are rendered permeable to the surrounding serum, and this effect is destructive to the parasites. Great care must be taken in handling tubes containing cultures to keep them in an upright position. Tilting to the side results in burying and killing the living parasites in the thin layer at the top of the column of cells. With sufficient care a sample may be removed from the culture and the tube be returned to the incubator without killing the parasites. This may sometimes be repeated several times.

Technic for Cultivating More Than One Generation of Parasites.

If more than one generation of plasmodia is to be cultivated, it is necessary to remove the leucocytes at the time the culture is made in order to avoid destruction of the parasites by them at the time of segmentation. The infected blood from the patient is centrifugalized sufficiently to force the leucocytes to the surface of the cells. The length of time necessary to centrifugalize varies with the speed, length of arm, etc., of the particular centrifuge used and should be determined by experiment. Unnecessary centrifugalization should be avoided.

The supernatant serum is drawn off and put in culture tubes. The column of serum in each should be 1.25 to 2.5 cm. deep. Cells and plasmodia are carefully drawn from about the middle of the centrifugalized cells and planted at the bottom of the

Digitized by Google

serum in the culture tubes. Flat-bottom (Fig. 1, 5) tubes are an advantage. One to two tenths of a cubic centimeter of cells in a half-inch tube make the thickest layer in which it is possible to get a homogeneous growth of parasites.

We have been able to secure growth of all the parasites in about twice this quantity of cells in a 1.25 cm. tube by employing tubes with a paper shelf suspended in them (Fig. 1, 6). They are filled with serum to at least 1.25 cm. above the level of the support for the paper disk. The disk is then carefully tucked in place, after which the cells are placed on it.

We have obtained even more satisfactory results with tubes filled 1.25 cm. deep, or more, with freshly prepared human plasma (Fig. 1, 7). These are conveniently prepared by placing 1.25 to 2.5 cm. of blood, immediately after it is drawn, in culture tubes and centrifugalizing to throw the cells to the bottom before coagulation takes place. By continuing centrifugalization until after coagulation occurs, a flatter surface is secured for the plasma than if it is discontinued before this time. In such plasma bottom tubes 1.25 cm. of fresh dextrose serum is placed and then cells and parasites from the centrifugalized and defibrinated dextrose blood are carefully distributed over the surface of the plasma. We have sometimes obtained in these tubes a layer of live parasites approximately 0.25 cm. thick.

Parasites in such leucocyte-free cultures develop, segment, and most of the merozoites enter new red blood cells. These young parasites develop in the same manner as the first generation and sometimes reach the stage of segmentation. In fact, we have in one instance observed the development of three successive generations in such a culture. More often, however, the parasites begin to die out after the first segmentation and especially after the second. We have not been able to determine exactly the cause of this. In order to perpetuate the culture it is necessary to transfer a portion of the cells and parasites to a recently prepared tube containing fresh cells and serum. It is convenient to place the fresh serum in the culture tube and to take up in a large capillary pipette a portion of the cells and parasites of the culture and then about five times the amount of fresh cells. These are mixed in the pipette (avoid air) and

Digitized by Google

then carefully spread on the surface of the plasma, paper shelf, or bottom of the tube, according to the particular kind of culture tube used. The transplantation should be done within four or five hours of the time of maximum segmentation and therefore approximately every forty-eight hours for tertian and estivo-autumnal parasites.

It often occurs that with each successive transplant fewer parasites survive than in the previous one, and finally the culture is lost. In fact, there is little or no increase in the number of parasites in the body of man in most instances. Actually not more than one merozoite out of every fifteen to thirty survives. With the most exact technic we have secured a fifth generation containing many more parasites than the first, and there is good reason to believe that with sufficiently exact manipulations it will be possible to continue the cultures indefinitely.

The Influence of Dextrose in Cultures.

Dextrose was employed with the idea that it might serve a two-fold purpose, viz., produce anaerobiasis and decrease the permeability of the red cells to the surrounding fluid. I am still in doubt, however, whether it performs either of these functions to the advantage of the malarial plasmodia. We have attempted to grow the parasites in blood, without the added dextrose, under the most rigid anaerobic conditions, but always without success. They usually appear to contract for a time, the outline becoming less irregular, and if a clear space (ring form) had been present, this closes. We sometimes call them "balled-up (Fig. 13, A) parasites." Later the protoplasm loses its ability to stain, and finally the chromatin also. In the instance of *Plasmodium vivax,* after an hour or more they present the "knotty" appearance of parasites in the blood of a patient under the influence of quinine. Dextrose added to these dead and dying parasites will not revive them.

We have repeatedly noted that if a little water is added to blood containing plasmodia the infected cells begin to swell, whereas the uninfected cells may appear normal. This swelling increases, often resulting in rupture of the cells. Coincidentally with the swelling of the cells the parasites promptly die. If

Digitized by Google

we produce slight hemolysis of the blood containing parasites the infected cells hemolize first and the parasites promptly die. This would seem to indicate that the parasites may be destroyed by the serum or some part of the serum when exposed to such substances. In defibrinating the blood we remove a substance, fibrinogen, which has a very large molecule and which may prevent this edema of infected cells in vivo. It is possible that the dextrose with its large molecule interferes with or prevents osmosis of the destructive serum.

The very destructive capacity of the serum in a successful culture is illustrated by what happens if a segmenting culture is shaken so as to suspend temporarily the parasites and cells in the serum. It is to be understood that at this time the red cell capsules surrounding the parasites are very thin and therefore easily penetrated by the serum and, indeed, many of them have already been perforated by the developing parasite so that the serum readily leaks in. Within a few minutes the parasites stain poorly and are actually dead (Fig. 16, B). Shaking a young culture, on the other hand, does not produce this effect. The parasites are protected by a more efficient capsule of red cell substance at this time.

Though dextrose is the normal sugar of the blood and tissues and would therefore be chosen for this purpose, it would seem probable that other sugars might have the same effect on osmosis. They might be expected to protect plasmodia as well as dextrose does. Such is not the case, however. We tried saccharose, lactose, galactose, dextrin, mannite and maltose. The parasite promptly died in all except maltose. The preservative action of maltose is likely to be due to the presence of dextrose in maltose, or to the conversion of a part of the maltose into dextrose.

We have noticed that blood drawn within one or two hours after the patient had eaten a full meal, or after violent exertion, was much more serviceable for culture media than if drawn after long fasting and rest. Probably there is a larger amount of blood sugar in the blood during digestion and exercise than during fasting and rest. In fact, we failed to grow tertian parasites in blood drawn after the patient had been fasting, though the usual quantity of dextrose was added.

Digitized by Google

Many experiments have been made to determine the most favorable quantity of dextrose to employ, and they indicate that between one-half and one per cent.is best. Smaller quantities often are not protective. Larger quantities delay the growth of the parasites. It seems, however, that the larger the quantity of dextrose, the better the protection against destructive influences. If we add 8% of dextrose the parasites live several days practically unchanged in appearance, but they do not grow. They do not become "balled up" and die as they do in the absence of dextrose.

Discussion of Special Features of the Technic.

The temperature at which parasites are grown influences very much the rate of growth. When grown at 41° C. the segmentation cycle is reduced to about thirty hours. It is usually less than forty-eight hours when the incubation temperature is 40° C. It averages about forty-eight hours when the incubation temperature is 39° C. At 37° C. most cultures require more than forty-eight hours for complete segmentation from youngest ring forms. It has been our observation that a good many cultures fail to reach the stage of segmentation when incubated at temperatures below 37° C., though we have had one culture of *Plasmodium vivax* that segmented at room temperature in five days. It is quite true that often the parasites remain alive considerably longer at the lower temperatures, but they grow very slowly. They can be kept alive in dextrose blood in the ice box for an incredibly long time. They live in the ice box without the addition of dextrose for some time. On the other hand, they are quickly destroyed by any unfavorable condition, in a short time, at the higher temperature at which they grow most rapidly.

Serum from different individuals is not equally serviceable for the cultivation of malarial plasmodia. The parasites failed to grow in the presence of some of the sera we experimented with. We have cultivated both tertian and estivo-autumnal plasmodia in the presence of Locke's fluid, minus calcium chloride, and in the presence of different ascitic fluids, one of which had been drawn nearly two months. Dextrose was always

Digitized by Google

required and the growth was never so good as when human serum was used.

The parasites have been grown in the presence of red blood cells only. We have not seen any evidence that they can be grown independently of these cells. As already stated, they cannot live for even a few minutes free in the serum. Serum inactivated of its complement is less destructive, but the plasmodia cannot live in it for any considerable length of time. When cultures are prepared according to the technic described for the cultivation of one generation only, the leucocytes migrate more or less toward the surface and soon become actually concentrated in the layer in which the parasites grow. Leucocytes do not phagocytize parasites as long as they are inside of the red blood cells, but as soon as segmentation takes place and the capsule of the red cell ruptures, liberating merozoites, the latter are promptly engulfed (Fig. 15). In fact, it is not uncommon to see a leucocyte that has phagocytized one or more full rosettes. This probably occurs after the parasite has digested the capsule or otherwise made a small opening through it whereby the two act like a foreign body which the leucocytes try to remove. Dead parasites in red blood cells are also phagocytized, provided the enveloping cell substance is sufficiently permeable. Parasites phagocytized are soon killed and finally digested. They lose their ability to stain well in a very few minutes and appear as pale bodies even in well-stained specimens. The chromatin is more resistant to digestion by leucocytes and therefore can be demonstrated much longer after they have been phagocytized than can the protoplasm. As a result of this phagocytosis, few, if any, parasites in a culture containing leucocytes develop a second generation.

Description of Developing Parasites.

In successful cultures the asexual parasites grow, segment, and form rosettes which burst and give rise to merozoites, many of which enter new red blood cells in exactly the same manner as they do in the body of man. Pigment appears in parasites after about fifteen to twenty hours from the youngest ring forms. It is coarser in *P. malariae,* less so in *P. falciparum* and

Digitized by Google

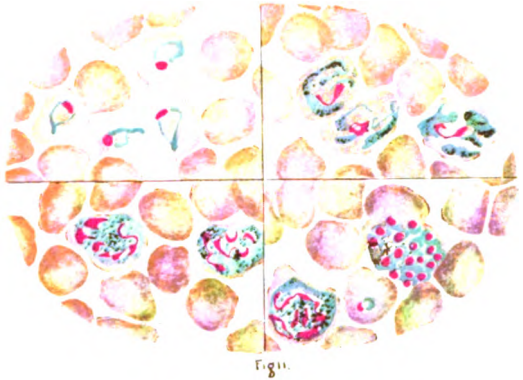
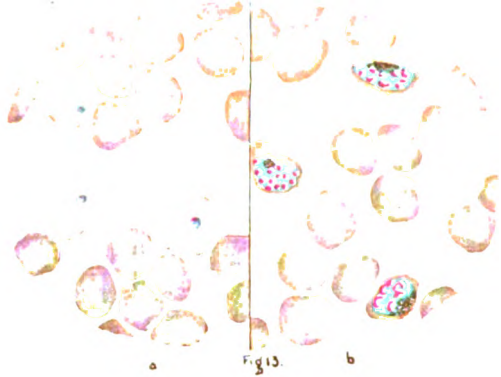


Fig 11.



a Fig 13. b

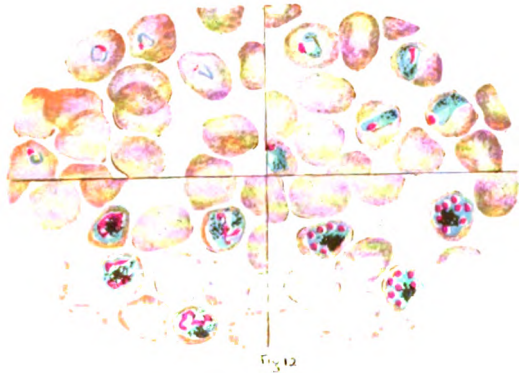
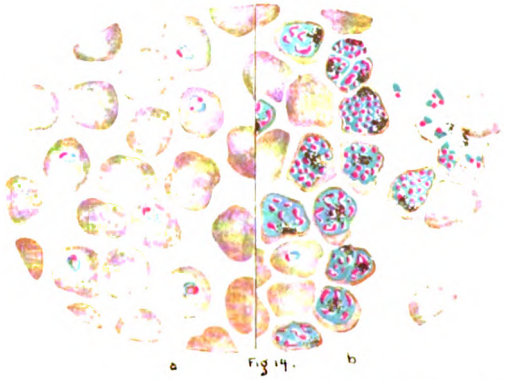


Fig 12



a Fig 14. b

Digitized by Google

Digitized by Google

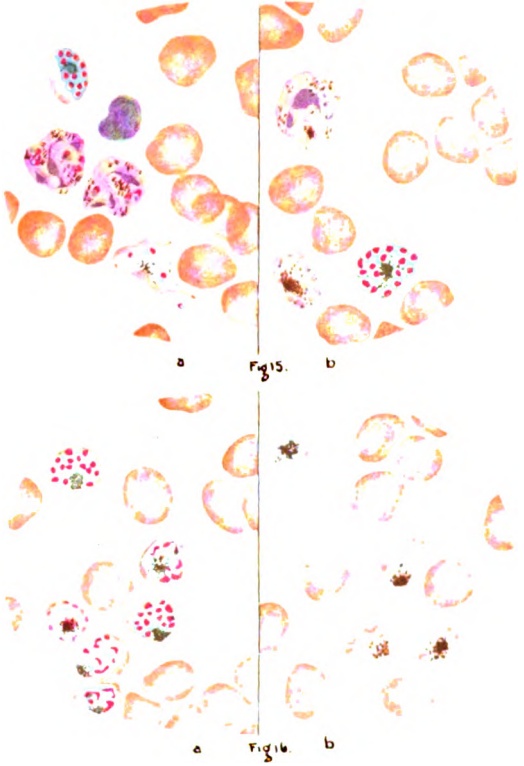


Fig 15.

Fig 16.

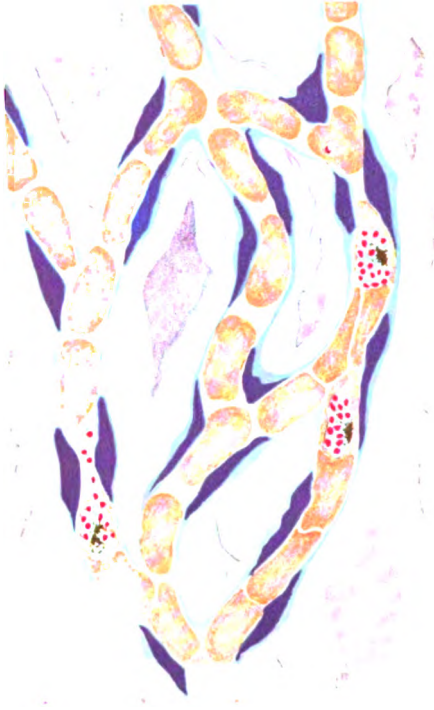


Fig 17.

Digitized by Google

Digitized by Google

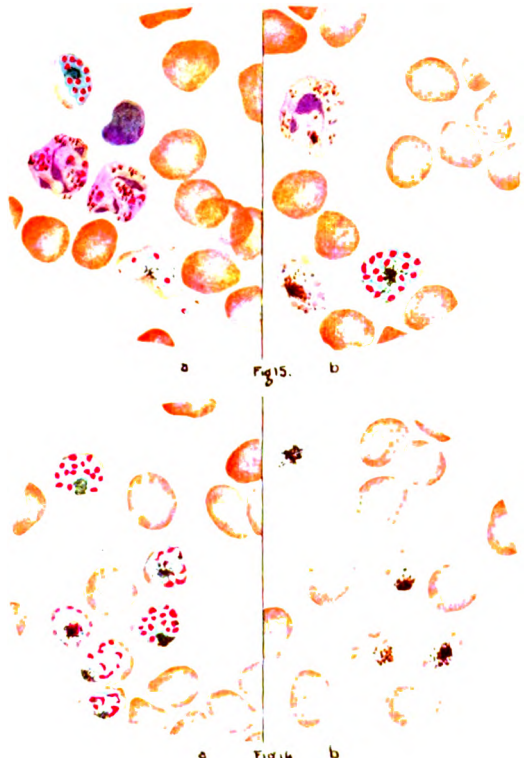


Fig 15. a b

Fig 16. a b

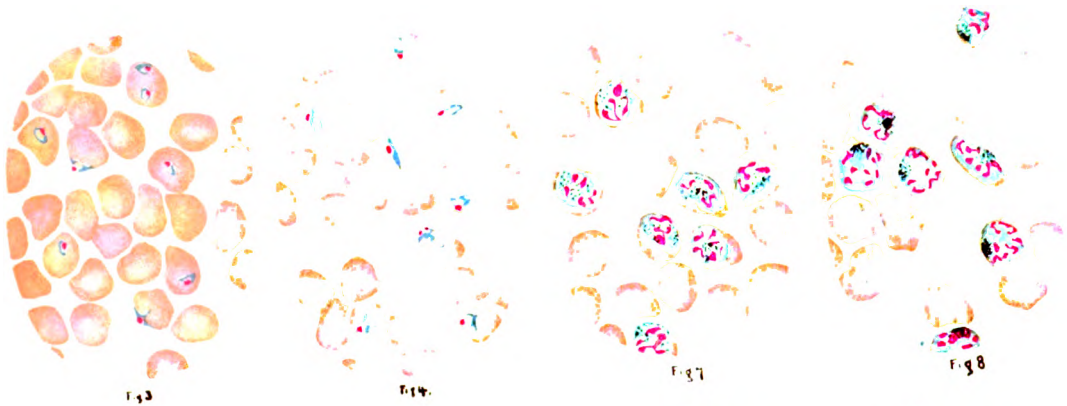
BASS

Fig 17.

MALARIAL PLASMODIA

Digitized by Google

Digitized by Google



BASS

MALARIAL PLASMODIA

Digitized by Google

Digitized by Google

finest in *P. vivax*. For a time it is distributed throughout the protoplasm of the parasite, but it begins to collect in a mass whenever segmentation begins. This seems to be true of all three species. (See Figs. 2 to 12.) In the instance of *P. falciparum* especially the process of segmentation requires many hours for its completion, during which time different parasites can be found which contain very variable numbers of segments.

P. falciparum (Figs. 2 to 10) are irregular in outline for about twenty hours, after which they become round or oval and show very little or no ameboid movement thereafter. They do not gain much in size during the first ten to twenty hours. After they begin to develop pigment they grow much more rapidly.

P. vivax (Fig. 11) remains irregular in outline and shows active ameboid movement right up to the time of beginning segmentation.

P. malariae (Fig. 12) shows the familiar band appearance in some of the young parasites, otherwise the parasites appear round, or oval throughout their development, which is strikingly slower than in the case of the other species.

Some Ideas Relative to Reproduction of Malarial Plasmodia in Vivo, Suggested by These Observations.

Judging from our observations of malarial plasmodia growing *in vitro* and from experiments that we have been able to make with these cultures, we believe that *in vivo* they can pass from cell to cell only when a cell is in direct contact with another cell containing a segmenting parasite, and then only when the opening for the exit of merozoites occurs opposite the cell to be infected. The substance of malarial plasmodia is very different in consistency from that of red blood cells and therefore they cannot pass through the smallest capillaries like the more yielding fluid-like red blood cell can do. That the consistency of the protoplasm of the parasite is less yielding than that of the red blood cell is shown by the fact that when a small quantity of a culture containing large parasites is spread over a slide with the end of another slide, all the large parasites are dragged to the end of the spread, though the red blood cells and small

Digitized by Google

parasites are left behind (Fig. 14). Large estivo-autumnal plasmodia are round or oval; the tertian variety are more or less flattened. If a proper amount of culture containing estivo-autumnal parasites is placed on a slide and covered with a cover glass, it is found upon studying the specimen under the microscope, while variable pressure is made on the cover glass, that the parasites are not moved, though the red blood cells flow back and forth with great ease. This is due to their round or oval form and firm consistency. Marchiafava and Bianami[11] noted this phenomenon in splenic puncture and autopsy material containing large parasites.

As a result of their unyielding consistency, malarial plasmodia, after they attain sufficient size, lodge in the capillaries of the body, especially where the current is weakest, and where slight obstruction is produced by the protruding of nuclei of endothelial cells inward. Here they remain and develop until they segment (Fig. 17). In the meantime other red blood cells are forced against them and if the opening in the infected cell occurs in a favorable location one or more merozoites pass directly into the other cell. If the opening in the infected cell occurs on the side of a cell in the direction of the current the merozoites are poured out free into the blood and are killed at once. Whenever the segmented parasite has become sufficiently broken up it can pass on through the capillary into the circulation, where the remaining merozoites are almost instantly destroyed. The debris and pigment are phagocytized by the mononuclear cells of the blood and the endothelial cells of the vessels, and finally are either destroyed or stored in the spleen and other tissues of the body. A very heavy infection may result in plugging sufficient of the brain capillaries to produce coma and "cerebral malaria."

We have observed that calcium salts, when added to cultures of estivo-autumnal plasmodia *in vitro*, cause hemolysis of the infected red blood cells and possibly also of many non-infected cells. These salts have not the same effect on normal blood. This seems to result from precipitation of other substances from the serum. The amount of calcium necessary to produce hemolysis is only slightly in excess of the amount present in normal

Digitized by Google

blood and might very possibly be reached by the ingestion of considerable quantities of calcium in drinking water or food. We have here a suggestion for an explanation of malarial hemoglobinuria. Individual and locality susceptibility may thus be explained.

It is suggested that quinine has no direct destructive effect upon malarial plasmodia, its effect being possibly to render the red blood cell protecting the parasite more permeable to the all-sufficient destructive influence of the serum. If this is true, quinine would affect only the parasites in the circulation and not those lodged in the capillaries, which would not be reached by it until they segment. The effect of quinine is defeated by influences such as diet, exertion, etc., which increase the dextrose content of the blood, whereby the permeability of the red blood cells seems to be decreased. These suggestions may possibly lead to a better understanding of the principles involved in the treatment of malaria, and enable us to exchange empiricism for rationalism.

We may have herein an explanation of the manner in which all blood cell parasites of man and animals pass from cell to cell; and it is even possible that the same principles apply to all cell parasites of man and animals.

The size of the capillaries and the amount of blood pressure have an important influence upon the stage at which malarial plasmodia recede from the peripheral circulation. They may be important factors in the production of "cerebral blocking."

Appreciation.

In preparing this paper I have drawn freely from our earlier papers.[1] [2] In several instances considerable parts of these papers have been copied *verbatim*. This is especially true in describing the technic. I am deeply indebted to my co-worker, Dr. F. M. Johns, who has helped me with most of my experiments, for most of the illustrations, without which this article would be very incomplete.

Digitized by Google

Bibliography.

1. Bass, C. C. A New Conception of Immunity: Its Application to the Cultivation of Protozoa and Bacteria from the Blood and to Therapeutic Measures. Journal Amer. Med. Assn., 1911. Vol. LVII, p. 1534.

2. Bass, C. C., and Johns, Foster M. The Cultivation of Malarial Plasmodia (*Plasmodium vivax* and *Plasmodium falciparum*) in vitro. Journal Experimental Medicine, 1912, Vol. XVI, pp. 567-569.

3. Laveran, A. Traite du Paludisme, translated by Thompson, J. H. London, 1893, 28.

4. Coronado, T. V. Chron. med.-quir. de la Habana, 1891, Vol. XVII, p. 280; 1893, Vol. XIX, p. 374.

5. Miller, cited by Laverar, A., Traite du Paludisme, Paris, 1891.

6. Sakharov, Rosenbach, Blumer, Hamburger and Mitchell, cited by Thayer, W. S., Lectures on the Malarial Fevers, New York, 1901.

7. Lavinder, C. H. A Note on the Cultivation of Malarial Plasmodia after the Method of Bass and Johns. Journal Amer. Med. Assn., 1913, Vol. LX, p. 42.

8. Carter, H., and Thompson, David cited by Thompson, J. H., and Thompson David. The Cultivation of One Generation of Benign Tertian Malarial Parasites (*Plasmodium vivax*) *in Vitro*, by Bass's Method. Ann. Tropical Medicine and Parasitology, 1913, Vol. VII, pp. 153-164.

9. Thompson, J. H., and McLelland. The Cultivation of One Generation of Malarial Plasmodia (*Plasmodium falciparum*) *in Vitro* by Bass's Method. Ann. Tropical Medicine and Parasitology, 1912, Vol. VI, pp. 449-462.

10. Thompson, J. H., and Thompson, David. The Cultivation of Benign Tertian Malarial Parasites (Plasmodium vivax) in Vitro by Bass's Method. Ann. Tropical Medicine and Parasitology, 1913, Vol. VII, pp. 153-164.

11. Marchiafava, E., and Bignami, A. The Parasites of Malarial Fevers, translated by Thompson, J. H., London, 1894, 218.

12. Zieman, Hans. Ueber die Bassche Kultur der Malariaparasiten in Vitro and die daraus sich ergebenden Resultate. Contralbl. f. Bakt. 1. Abt., Orig. 1913. Jan. 11, Vol. 67, No. 6, pp. 482-489.

13. Ziemann, Hans. Ueber die Kuntsliche Wieterentwicklung (in vitro) das Tertian Malariaparasiten. Deut. Med. Wochenschr. 1913. Feb. 6, Vol. 39, No. 6, p. 260.

Figure 1.

1. Syringe.
2. Defibrinating tube.
3. Defibrinating tube (with needle).
4. Culture tube (plain).
5. Culture tube (with flat bottom).
6. Culture tube (with paper shelf).
7. Culture tube with plasma in bottom.
8. Pipettes (small).
9. Pipettes (large).
10. Pipettes (graduated).
11. Rubber tube.

Figure 2.

1. Culture on paper disk.
2. Culture in flat bottom tube.
3. Culture in plasma bottom tube.
4. Ordinary form cultures.

Digitized by Google

Figure 3.

Blood directly from patient. Heavy infection of Plasmodium falciparum.

Figure 4.

Development of the same parasites in culture. Note irregular outline of some parasites.

Figure 5.

Further development. Outline more regular. Pigment granules appearing.

Figure 6.

Further development. Chromatin polymorphous and beginning to divide.

Figure 7.

Further division of chromatin. Pigment beginning to collect *en masse.*

Figure 8.

Still further division of chromatin. Pigment collected in a definite mass.

Figure 9.

Segmentation complete. Beautiful rosettes. One has ruptured, liberating free merozoites, two of which appear on red cells ready to begin another cycle.

Figure 10.

Young parasites of the second generation. Note debris from previous segmentation.

Figure 11.

Different stages in the development of *Plasmodium vivax* in culture.

Figure 12.

Different stages in the development of *Plasmodium malariae* in culture.

Figure 13.

A. A culture without dextrose. "Balled up" dead parasites.

B. A similar culture with one-half per cent. dextrose. Parasites growing luxuriantly.

Digitized by Google

Figure 14.

This shows how the large parasites may be dragged to the end of a spread.

A shows the cells and size of parasites left along the spread, and B shows all the large parasites dragged to the end of the spread. B also shows development and segmentation of two and three parasites in one red cell.

Figure 15.

A. Phagocytosis by the neutrophiles of estivo-autumnal merozoites and pigment.

B. Phagocytosis of tertian plasmodia and pigment. Also a dead rosette.

Figure 16.

A. Segmenting parasites, in culture. One pale, no doubt dead.

B. The same after the cells and parasites were shaken with the supernatant serum.

Figure 17.

Segmenting parasites in brain capillaries, schematic, showing how parasites plug the capillaries and also how merozoites actually pass from rosette to new red cell without exposure to the serum or plasma. This also shows how parasites are held in the capillaries at narrow places after they have developed to sufficient size.

Digitized by Google

PROGRESS REPORT IN THE USE OF EMETINE IN AMEBIC DYSENTERY.*

By WILLIAM ALLAN,
Charlotte, N. C.

It is unnecessary to detail again the steps by which the soluble salts of emetine were brought forward by Vedder[1] and by Rogers[2] for the treatment of amebic dysentery. The first clinical report was published June 22, 1912,[2] and during the eighteen months which have since elapsed, favorable reports have come from Asia,[3] Europe,[4] North[5] and South[6] America.

No dangerous symptoms have been reported from the use of the drug itself in moderate doses, and so far it has rarely failed to cause rapid and marked improvement in the symptoms of both dysentery and liver abscess, with disappearance of active amebæ. The rapidly accumulating clinical evidence seems to confirm the previous experimental findings that emetine is specifically amebacidal, but there is no evidence to show that it will eradicate cysts. In fact, the evidence at hand so far points to the opposite conclusion.[3 9b]

In spite of the widespread and enthusiastic adoption of this therapeutic measure, a great deal of work remains to be done. In many of the case reports the injection of emetine was followed by the administration of ipecac by mouth, so that such reports are not safe evidence of the action of the single alkaloid emetine. The dosage introduced by Rogers and followed by most observers is from one-third to one grain, given twice a day, daily, or every second day for a week or ten days only.

At present the evidence in regard to the permanence of cure by emetine is extremely meager. In the thirty-two cases reported by Rogers[2e] the active amebæ disappeared promptly after doses of one-third to one grain; one case is reported as well five months later,[2e] and in several of these cases which later came to autopsy from other causes no amebæ were found in sections of the gut.[2d] There has been no report on the

*Read at the sixteenth session Tri-State Medical Association (Virginia and Carolinas), Wilmington, N. C., Feb. 18-19, 1914.

Digitized by Google

later history of the remainder, but Rogers is inclined to believe that they are permanently cured. Chauffard[4] has reported three cases. In the first the dysentery cleared up entirely in five days with six doses of .6 grain emetine. His second case, with liver abscess, was given three doses of .6 grain subcutaneously and one injection of .3 grain into the liver and cleared up promptly. His third case was given five grains in a week, with rapid recovery. This dosage is to be repeated in the last case, but there has been no further report on these cases.

Rouget[7] reports the cure of a liver abscess, but without details and without further history.

Flandin[8] also reports the cure of a liver abscess, operated on, and given .3 grain a day; no later report.

Dopter[9a] reports a case of dysentery apparently cured by the injection for three days of 1.2, .6 and .6 grains; later[9b] he reports the use of emetine in fifty-one cases of abscess or dysentery, finding that emetine always killed the active amebæ, but not the cysts, the latter being responsible for relapses.

Maxwell[10] reports ten cases treated in China with favorable results; no later report.

Allan[11] reported two cases which promptly cleared up and as promptly relapsed. Later two other cases were reported. The subsequent history of these cases will be found in this report.

Lyons[5] has reported seven cases. One was moribund on admission and died. The other six were rapidly cleared up with daily doses of one-third to three-fourths grain, reaching a total of 1.1 to 5.2 grains. He has been able to follow five of these cases from one to five months, and up to the time of his last report there had been no relapses.

Le Blanc[12] reports success with emetine, using a 1-to-5,000 solution in the colon.

Cloud[13] reports one case cleared up with doses of .5, 1, 1 and 1.5 grains; no later report.

Spittel[14] reports a case of liver abscess, dying of peritonitis, in which the size of the abscess was markedly decreased by the use of emetine.

Baermann and Heinemann[3] have reported in full the treat-

Digitized by Google

ment of twenty-two cases in Sumatra. Seven of their cases were too far advanced to be able to counteract the effects of extensive ulceration and hemorrhage, and consequently died. In three of these sections of the gut were free from amebæ; in three the amebæ in the gut wall still retained their form; in one, after a single dose of .8 grain, many amebæ were found. At the time of their report, six months after treatment, only three of the living fifteen cases were still free from both amebæ and cysts. In the hands of these observers, single subcutaneous injections of 60 mg. of emetine were without effect in two cases. After two subcutaneous injections of 60 mg. in two cases amebæ reappeared within three weeks. After three subcutaneous injections of 60 mg. in nine cases amebæ reappeared in eight; four died, and in one of these sections of the gut were ameba-free. The ulcers were healing in the other three. Of the five cases still living in this group, four show lasting improvement, two will apparently recover, while three still show cysts. In one case, after five subcutaneous injections of 60 mg., amebæ reappeared in eighteen days. In two cases, after subcutaneous injections of 120 mg., followed by 60 mg., clinical recovery was rapid; both remained free from trophozoits, but one shows cysts. In one case subcutaneous injections of 125, 60, 120 and 60 mg. were given, and this case has remained ameba-free, although previously the same case had failed to clear up after three subcutaneous injections of 60 mg. and two intravenous injections of a different brand of emetine. Subcutaneous injections of 120, 120, 120 and 150 mg., followed in two weeks by injections for three days of 120 mg., failed to have any effect on the amebæ in one case. In two cases intravenous injections of 70 and 100 mg., respectively, were given after two and three subcutaneous injections, respectively, of 60 mg. had failed. In the first case active amebæ disappeared, but cysts remained. At autopsy later the ulcers were healing and sections of the gut were ameba-free. The second case cleared up, but relapsed after seventy days. Two intravenous injections of 100 mg. were given in two cases, with no effect in one and with a relapse after thirty days in the other. In one case the intravenous injection of 150 mg. was without effect, as had been repeated subcutaneous

Digitized by Google

injections of emetine from two other sources. Cysts were still present after intravenous injections of 150 and 100 mg. in another case. Intravenous injections of 200 mg. cleared up one case, and at autopsy seventeen days later sections of the gut were ameba-free. Intravenous injections of 300 mg. in one case and of 400 mg. in another cleared up the clinical symptoms in both, and these two cases have remained free from active amebæ. Cysts are still present, but feeding the stools to kittens has failed to produce dysentery in them. After eliminating active amebæ from one case by two intravenous injections of 100 mg., the stools, still showing cysts, were fed to two kittens, both of which came down with amebic dysentery on the twelfth day following.

These authors point out that emetine seems to have very little effect on cysts, and that there is considerable variation in the emetines now on the market from different sources, as cases which proved refractory to one brand sometimes recovered promptly when a different emetine was used. They conclude that emetine is strongly amebatropic and amebacidal, but that there are races of emetine-fast amebæ. They recommend one or two subcutaneous, or better, intravenous injections of 100 to 150 mg. of emetine, to be followed every second or third day with subcutaneous injections of 100 to 120 mg., for four or five doses; then the giving of emetine is to be repeated at three or four week intervals.

Sewell[15] reports the recovery of a liver abscess which had ruptured into the lung. He started with one-third grain and increased the dose, giving in all 2 1-3 grains; no later report.

Verteuil[16] reports one case of dysentery apparently cured by three injections of one-third grain. Seven more doses of the same size were given to be on the safe side; no further report.

Harrison[17] reports favorably on emetine, giving one-fourth to one-half grain doses for ten days, then twenty grains of ipecac daily for two weeks. At the same time he irrigates the bowel with saline, and later with saline and quinine.

Molesworth[18] has had success with emetine, using one-sixth to one-third grain doses and giving nine injections weekly.

Digitized by Google

McArthur[19] reports two cases of liver abscess cured by repeated injections of one-third grain emetine; no later report.

Thompson,[20] in whose district in Ireland amebic infection causes about 85 per cent of all dysentery, has treated 150 cases of undifferentiated dysentery with excellent immediate results. He uses one-third to one grain doses.

Roehr[21] reports the cure of six cases of dysentery, but without details.

Eustis[22] reports the cure of a long-standing abscess of liver and lung, which has remained well for eight months.

Wagner[23] reports the clearing up of six cases, two of which relapsed within the year and returned for treatment; no later reports on the other four.

From this brief summary of the literature it will be seen that, with the exception of Lyon's second report, the author's second report and the excellent report of Baermann and Heinemann, everybody has reported simply immediate results and that sufficient time has not yet elapsed to tell whether or not these cures are permanent.

At present emetine hydrochlorid and hydrobromid are the salts used. The size of the dose has varied from one-fourth to six grains. It is being given by mouth, by rectum, subcutaneously and intravenously. It is being given daily in single or several doses, on consecutive days, on alternate days, and irregularly. Most observers have discontinued the use of the drug as soon as the clinical symptoms have cleared up, or shortly after the amebæ have disappeared from the stools.

My limited experience has served to convince me that small doses, repeated daily or almost daily, for a few days, are not sufficient to eradicate the ameba, for more than half of my cases have relapsed within the first year after treatment. As nobody has reported bad results, I think it better to give maximum instead of minimum doses, that is two to three grains instead of one-half to one grain. The necessity for intermittent treatment seems evident. Rest in bed and restricted diet seem unnecessary except in the severest cases. My case reports have been tabulated for convenience:

Digitized by Google

No.	Color	Sex	Age	Duration	Previous Treatment	Emetine	Other Treatment	Stools Afterward	Symptoms Afterward	Date of Relapse	Later Report
76	Negro	M	22	2 years	.6gm of 606 in Feb., 1912 400 grs. ipecac Sept. 8-16, 1912 200 grs. ipecac Dec., 1912	Nov. 2—.6gr. of E-HBr. Nov. 3—.83 Nov. 4—.7 gr. Nov. 5—1.3 gr. Dec. 17—.83 gr. of E-HBr. Dec. 18—1.5 grs. Dec. 21—1.6 Dec. 23—2 grs. Dec 30—2.4 Dec. 31—4 grs. Jan. 13—2 grs. Jan. 14—4 grs. Jan. 17—4 grs.	Dec. 30 to Jan. 2 in bed. Jan. 30 put on bismuth treatment which failed Feb. 13 given $AgNO_3$ enemas	From Sept. to Jan. 1, stools bloody. Normal Jan. 2-12 Bloody Jan. 12-14 Loose Jan. 14-Feb. 13 Ameba-free on Feb. 27	Dysentery to Jan. 1, Jan. 30, Feb. 13	Jan. 12, after 10 days	Moved to Washington, D. C. in April, 1913
78	White	M	51	5 weeks	Bed and astringents	Dec. 21—.8 gr. of E-HC l Dec. 22—1.4 gr. Dec. 23—1.4 gr. Jan. 14—2 grs. Jan. 16—2 grs. Jan. 18—2 grs.	In bed Dec. 21—28 Ipecac grs. 30 on Jan. 17, 18, 19, 20	Ameba-free on Dec. 22, normal Dec. 26. Ameba-free on Jan. 31	No return of symptoms np to Feb. 1, 1914	Jan. 13, after 15 days	No further relapse in 12 mos.
80	Negro	M	55	19 mo. Probably started in 1899		Feb. 3—1.5 gr. Feb. 4—4 grs.	Ipecac grs. 30, on Feb. 6, 7, 8	Cysts Feb. 6, 7 Ameba-free Feb. 8, 15	No relapse in 12 mos.		No return to Feb. 1, 1914
81	White	M	26	5 months		Feb. 15—2 grs. Feb. 16—4 grs. Feb. 17—2 grs.	Bed, reg. diet 30 grs. Ipecac on Feb. 18, 19, 20	Ameba-free Feb. 22, Mar. 15 Apr. 5, May 24	No relapse		Well on Jan. 1, 1914
82	White	M	22	12 months		Mar. 13—2 grs. June 30—2 grs.	Bed, Mar. 13—15	None on Mar. 14,15 Amebae June 28	Dys. on June 25	After 3½ mos.	Well Feb. 1, 1914

Digitized by Google

84	White	M	19	38 months	De-emetized ipecac Mar. 1911	May 9, 1913—.9 grs. May 11—1.25 gr. Aug. 30—2 grs. Aug. 31—2 grs. Sept. 1—2 grs.		Ameba-free May 11, 1913 and Aug. 31, Sept. 1, 2 Oct. 15	Dys. in June, July, August	June, after 1 mo.	Well Dec. 1913 Gained 20 lbs.
85	White	M	43	7 months	Bed and astringent	May 21—2 grs. May 23—1.6 gr.		Ameba-free on May 24, 28	Dys. from June to January, 1914	June, in 3 weeks	Treatment repeated Jan. 1914
86	White	F	24	13 months		July 12—1 gr. July 14—1.5 gr. July 15—2.5 gr. July 16—2.5 gr.	Bed. reg. diet	Ameba-free July 17, 18			Can't be traced
87	White	M	47	12 months	Bed	Aug. 6—2 grs. Aug. 7—2 grs.		Ameba-free Aug. 7	Well Aug. 27		Well Feb. 7, 1914
88	White	F	37	1 month		Aug. 5—1 gr. Aug. 6—2 grs. Aug. 7—2 grs.	Bed, reg. diet	Ameba-free Aug. 7	Well in Dec., 1913		No relapse in 5 mos.
89	White	M	27	1 month		Aug. 22—2 grs. Aug. 23—2 grs. Nov. 25—2 grs. Nov. 26—3 grs. Dec. 3—2 grs. Dec. 5—2 grs. Dec. 9—2 grs.	Ipecac Dec. 5 30 grs Dec. 6, 7 20 grs.	Ameba-free Aug. 24. Cysts Sept. 1, 8. Amebae Nov. 23. Free Nov. 27. Ameba Dec. 3, 4. Free Dec. 5, 10, 14, 28 Jan. 15. Feb. 1	No gain in weight	Nov. 23, after 2 mos.	No relapse in last 2 mos.
92	Negro	M	53	6 months	Sodium cacodylate	Nov. 20—2 grs. Nov. 21—2 grs. Nov. 22—2 grs.		Normal Nov. 22	Gained 27 lbs.		Well Feb. 7, 1914

Digitized by Google

As yet we do not know the best method of administration, the proper dosage, how often or how long to give emetine. We can only say positively, at present, that repeated small doses generally give brilliant temporary results. Only detailed reports of cases followed for a number of years will establish the value of this remedy as a permanent cure.

References.

1. Vedder, E. B. 1911; Bull. Manila Med. Soc., March.
2. Rogers, L. (a) 1912; *Brit. Med. J.*, June 22, Vol. I, No. 2686, p. 1409. (b) 1912; *Ibid.*, Aug. 24, Vol. II., No. 2695, p. 405. (c) 1912; *Therapeutic Gazette*, 3d series, XXVIII., No. 12, p. 837. (d) 1912; *Indian Med. Gaz.*, XLCII., No. 11, p. 421. (e) 1913; Dysenteries; Their Differentiation and Treatment. Oxford University Press. Henry Frowde, London.
3. Baermann, G., and Heinemann, H. 1913; M. M. W., Vol. LX., Nos. 21 and 22.
4. Chauffard, A. 1913. *Presse Medicale*, No. 39, May 14.
5. Lyons, R. 1913. *New Orleans M. and S. Jour.*, Oct., LXVI., No. 4, pp. 278-282.
6. Destefano, J. 1913. *Semana Medica* (Buenos Aires), May 22, No. 21.
7. Rouget. 1913. Quoted by *J. A. M. A.*, LX., No. 24, p. 1896.
8. Flandin, C. 1913. *Presse Medicale*, Sept. 24, No. 78.
9. Dopter, C. (a) 1913. Quoted by *J. A. M. A.*, LX., No. 24, p. 1896. (b) 1913. Bull. de l'Acad. de Med., Nov. 18, LXXVII., No. 36 (Abs. in J. A. M. A., LXII., No. 1, p. 76).
10. Maxwell. 1913. *China Med. J.*, March.
11. Allan, W. 1913. *Old Dominion J. Med. and Surg.*, Oct., XVII., No. 4, p. 173.
12. Le Blanc, B. O. 1913. *New Orleans Med. and Surg. J.*, Vol. 66, No. 5, pp. 398-399.
13. Cloud, R. E. 1913. *Jour. A. M. A.*, LXI., 21, p. 1899.
14. Spittel, R. L. 1913. *Brit. Med. J.*, Oct. 25, No. 2756.
15. Sewell. 1913. J. Royal Army Med. Corps, XX., No. 6.
16. Verteuil, 1913. *Lancet* (London), June 28.
17. Harrison, W. S. 1913. *Brit. Med. J.*, Nov. 15, No. 2759, p. 1282.
18. Molesworth. 1913. *Idem.*
19. McArthur. 1913. *Brit. Med. J.*, Aug. 30, No. 2785, p. 551.
20. Thompson, J. M. 1913. *Dublin Jour. Med. Sc.*, Aug., Vol. III., No. 500.
21. Roehr, C. G. 1914. *Charlotte Med. J.*, Jan., Vol. 69, No. 1, p. 25.
22. Eustis, A. 1914. *Amer. J. Trop. Dis. and Preventive Med.*, Vol. I, No. 7, p. 520.
23. Wagner, J. 1914. *Med. Record*, Jan. 31, Vol. 85, No. 5, p. 190.

Digitized by Google

SUGGESTIONS ON THE ANNUAL REPORT OF THE CITY HEALTH DEPARTMENT.

By WILLIAM H. DEADERICK, M. D.,
Hot Springs, Arkansas.

If one has an occasion to review a number of annual reports of city health departments, the feature which will strike him most forcibly will probably be the apparent lack of a definite program in assembling the report. The majority of such reports are merely slightly revised editions of those of previous years, and in many cases the compiler has been loath to introduce radical innovations or make any important changes whatsoever excepting to alter figures to conform to current statistics. The series of annual reports should constitute a complete history of the activities of the department of health.

The reasons for existence of the annual health report are for administrative purposes, that taxpayers may inform themselves as to how their money is being expended, and for its educational value.

Much may be learned from reports such as the recent one of Richmond, Va., and the report of the department of health of Chicago for the years 1907-1910 is the most substantial basis for an administrative code in existence.

The educational features of a health report are usually ignored, but are of the utmost importance. The citizens should be able to ascertain from the report not only the degree of prevalence of and number of deaths from preventable diseases, but also the means of prevention. The report should not only state the number of milk inspections made during the year, but should dwell on the importance of obtaining a pure supply of milk and of keeping it pure, and should demonstrate by figures the life-saving advantages of breast feeding.

The report should be issued promptly. With efficient methods of record keeping, a report should be in the hands of the printer very soon after the expiration of the year.

The paper upon which the report is printed should be sufficiently heavy to prevent embossing on the opposite side. The

Digitized by Google

margins should be cut and the type clear. A standard and uniform size should be adopted. It would be a decided advantage if standard forms for statistical tables were universally adopted. This would enable ready comparison from year to year, and with other localities, now impossible in many instances. Careful proof reading should exclude errata, especially in tabulations.

The extent of the fiscal year should be plainly and conspicuously stated.

Every report should contain a table of contents and an index.

The letter of transmittal, usually formal and void, might well contain a summary of activities of the year, of recent innovations, of contemplated improvements, of defects and recommendations.

Illusrations and striking methods of representing statistics, sueh as praphs, charts and pin maps, add greatly to the interest and value of a report.

Tables and illustrations should be properly placed, adjacent to the related text.

For easy reading, all the headings should not be major, but the text should be broken up into subordinate or dependent headings, according to their logical relation.

Educational and publicity methods should be dwelt upon.

Each principal cause of morbidity and mortality should receive full discussion, giving the known causes of the disease and the methods of prevention. Tables of comparison for the past decade or semi-decade are interesting.

Mortality tables should conform to the international classification. It is unnecessary to list a disease from which no deaths have occurred.

The age classification of the United States Census Bureau should be followed.

Statistical procedure should comply with the rules of statistical practice of the American Public Health Association. Stillbirths should not be considered in mortality tables.

The following scheme is offered tentatively as a possible outline for annual reports of city health departments. If the

Digitized by Google

activities enumerated are not performed the urgent need therefor should be insistently stated:

- Contents.
- Organization.
  - Chart of organization.
  - Personnel.
  - Committees.
  - Addresses and telephone numbers.
    - Health office.
    - Substations and branches.
    - Hospitals.
    - Dispensaries.
      - Hours.
- Letter of transmittal.
  - Summary.
    - Activities.
    - Outside coöperation.
    - Recent innovations.
    - Defects.
    - Contemplated improvements.
    - Recommendations.
- General data.
  - Location.
  - Altitude.
  - Topography, water courses, etc.
  - Population.
    - Present and for past few decades.
    - How estimated.
    - Tables.
      - Wards and density.
      - Age groups.
      - Race or nativity.
- Sanitary inspection.
  - Organization.
  - Procedure.
    - Routine inspection.
      - Table.
    - Complaints.
      - Table.
    - Principal causes of complaint.
    - Smoke inspection.
- Food inspection.
  - Milk.
    - Organization.

Digitized by Google

- Regulations.
- Procedure.
  - Source of supply and consumption.
  - Inspection of herds.
  - Country inspection.
  - City inspection.
    - Tables.
- Meat.
  - Organization.
  - Regulations.
  - Procedure.
    - Live stock.
    - Post mortem.
    - Markets.
    - Poultry and eggs.
      - Tables.
- Other foods.
  - Bakeries.
  - Restaurants.
  - Food stores.
  - Etc.
    - Tables.

Water supply.
- Control.
- Source of city supply.
- Filtration, chemical treatment, etc.
- Storage.
- Analyses.
- Public drinking fountains.
- Private supplies.

Sewerage.
- Kind of system.
- Outfalls and discharge.
- Proportion of city supplied.
- Proportion of houses connected.
- Plumbing control.
- Privies and cesspools.

Garbage disposal.
- Control.
- Regulations.
- Procedure.

Communicable diseases.
- Organization.
- Procedure.
  - Reporting.

Digitized by Google

Medical inspection.
Quarantine.
Hospitals.
Placarding.
Routine inspection.
Termination.
Disinfection.
Communicable diseases of animals.
Pound service.
Flies.
Mosquitoes.
Separate consideration communicable diseases.
Vaccination.
Tables.
Each cause according to
Number of cases.
Number of deaths.
Case mortality.
Morbidity per ten thousand.
Mortality per ten thousand.
Per cent of total deaths.
Cause, age and sex.
Cause and months.
Cause and wards.
Cause and race or nativity.
Residents and non-residents.
Comparative rates principal diseases past ten years.
Graphic representations.
Child welfare.
Supervision of midwives.
Organization.
Procedure.
Ophthalmia neonatorum.
Tables.
Infant mortality.
Organization.
Procedure.
Prenatal instruction.
Milk supply.
Nursing service.
Medical service.
Tables.
Foundlings and institutions.
Organization.
Procedure.

Digitized by Google

- Tables.
- Medical inspection of schools.
  - Control.
  - Organization.
  - Procedure.
    - Nurses.
    - Inspectors.
    - Facilities for treatment.
  - Tables.
- Housing conditions.
  - Control.
  - Organization.
  - Procedure.
  - Tables.
- Laboratories.
  - Chemical.
  - Bacteriological.
  - Manufacturing.
  - Tables.
- Hospitals.
  - Control.
  - Tables.
- Care of indigent sick in homes.
  - Control.
  - Organization.
  - Procedure.
  - Tables.
- Cemeteries.
  - Control.
- Legal proceedings.
  - Organization.
  - Procedure.
  - Tables.
- Recent sanitary legislation.
- Health education and publicity.
- Vital statistics.
  - Organization.
  - Procedure.
  - Tables.
    - Deaths.
      - Cause, age and sex.
      - Cause and months.
      - Cause and wards.
      - Wards and sex.
      - Wards and age.

Digitized by Google

Wards and race or nativity.
Residents and non-residents.
Deaths in institutions.
Comparative death rates past ten years.
Crude.
Infectious diseases.
Other increasing or decreasing factors.
Births.
Sex.
Race or nativity of parents.
Wards.
Months.
Delivered by physicians, midwives, no attendant.
Plurality births, sex, color, parentage.
Illegitimacy.
Stillbirths.
Per 1000 births, per 1000 population.
Delivered by physicians, midwives, no attendant.
Marriages.
Months.
Race or nationality.
Diagrams.
Financial statement.
Revenues.
Expenditures (following "Uniform Accounts as a Basis for Standard Forms for Reporting Financial and Other Statistics of Health Departments," L. G. Powers, U. S. Bureau of the Census, Washington, 1912).
Meteorologic data.
Index.

Digitized by Google

CULTIVATION OF THE BACILLUS OF LEPROSY: A REVIEW.

By PAUL G. WOOLLEY, M. D.
Cincinnati, Ohio.

At the time when Clegg announced that he had been able to cultivate the bacillus of Hansen, new hope was aroused that at last there was a chance that the problem of the pathogenesis and cure of leprosy would soon be disposed of. To be sure, such a hope had been engendered by the publication of Kedrowski some years before, but nothing had come of it. In the case of Clegg's discovery, however, confirmation was immediately published in the articles of Duval, who was also able to cultivate the Bacillus lepræ, not only by following the method of Clegg, but also by a method of his own.

In the interval between the announcements of Kedrowski and Clegg, Rost, and Williams and Rost had also announced that they had cultivated the lepra bacillus, but on all sides doubt was thrown upon Rost's work, for the reason that his technic was not above suspicion. Rost, however, still insists that his method is productive of results, even though it is, as Frazer says, unnecessarily cumbersome and complicated. In spite of its complications it has accomplished no more than other simpler methods. By its use an organism has been cultivated which is as polymorphic as the method used in obtaining them. Williams, however, simplified Rost's method, but obtained no different results. Frazer, using Williams' method with potato broth, found no evidence of proliferation. Bayon has followed Kedrowski's method and has had the same success as Kedrowski.

Though many writers have published reports of cultivations of B. lepræ, the important consecutive work appears to have been done by Kedrowski, Clegg, Duval, Bayon and Frazer.

Bayon's general conclusions are as follows: (1) The leprosy bacillus belongs to the tuberculosis group. (2) Since there are many sorts of saprophytic acid-fast bacilli, it is obvious that the cultivation of an acid-fast bacillus from leprous material is not proof that the cultivated organisms are the cause of leprosy.

Digitized by Google

(3) Only Kedrowski's cultures have produced lesions in animals which resemble those of human leprosy. (4) The organism cultivated by Kedrowski and by Bayon is a pleomorphic one. Its relationship to the bacilli cultivated by other writers is not clear. (5) Leprosy is transmissable from man to rats. Organisms from cultures in the second generation produced fresh lesions in the liver and spleen of rats. But, Bayon says, there is as yet no conclusive proof that anyone has discovered the organism that causes leprosy, and this in spite of the fact that with Kedrowski's organism he could produce what seemed to be typical lesions. With Duval's, Rost's and Clegg's organisms he could not produce lesions. On the other hand, each of these investigators reports that he is able to produce tissue changes similar to those observed in human leprosy.

In 1911 Duval reported that he had been able to produce lesions in monkeys, but in each instance in which a lesion appeared, the monkey became well again and all signs of the disease disappeared. Later he reported that if a monkey were sensitized with killed or living bacilli before the experiments began, chances that he would acquire the disease would be multiplied. Acting upon this theory, Duval and Couret undertook a new series of experimental inoculations, using Macacus rhesus and Duval's organism. They first sensitized the monkeys and gave them repeated injections of large numbers of bacilli. Just what part the preliminary sensitizing dose accomplished is in doubt. At any rate they reported a fatal case of leprosy in one of their animals.

Duval divides the races of organisms which have been cultivated into four great groups, viz.: (1) Non-acid fast diphtheroid organisms, such as that of Kedrowski; (2) acid-fast chromogenic organisms, such as Clegg's; (3) non-acid-fast and acid-fast interlacing, filamentous streptothrices, such as that of Rost and Williams; (4) permanently acid-fast organisms, of stable morphology, which grow only in the presence of special nutritive materials, as illutrated by that cultivated by Duval. It was with this latter that he and Couret produced leprosy in the macacus. But in another place Duval says that the organism of Clegg, the grass bacillus and other acid-fast saprophytes will

Digitized by Google

produce lesions. Apparently he would consider morphology and serum reactions the most important tests. And yet, in spite of considerable work with sera, no conclusions have been reached, other than the tentative conclusion that the serum reactions indicate three general types, Clegg's, Duval's and the saprophytes. Recent work by Wherry, on the staining reactions of the tubercle bacillus which may be varied at will by chemical changes in the culture media, suggests that the only reason Duval's organism is always acid-fast is because it is grown in a medium the chemical composition of which results in color fastness. One might suggest also that the chromogenicity of Clegg's organism is due to similar factors. Reenstjerna makes a similar suggestion when he says that acid-fastness is a garment worn by the leprosy bacillus under certain conditions.

Clegg and Hollman also have made extensive studies of the serum reactions of organisms isolated from leprosy cases. They obtained pure cultures from fifteen cases, and with several saprophytes such as the Smegma bacillus, butter, grass, and margarine bacilli. They found that they could produce a horse serum which would agglutinate their organisms in a dilution of 1-1,000, and which had no effect upon the other organisms. Jeanselme says that on account of spontaneous agglutination of the lepra bacillus, this method is not important.

Reenstjerna produced lesions in several monkeys (M. thesus) with an organism that was sometimes acid-fast and somtimes not.

Finally Frazer and Fletcher report that in spite of using each of the technics followed by various workers, they have been unable to isolate, in a single instance, the leprosy bacillus. They used material from thirty-two non-ulcerating nodular cases of leprosy. They observed that the acid-fast rods persisted in their culture media, but found no evidence of growth.

The conclusion that a reader of the literature draws seems to be that each investigator believes he has cultivated the cause of leprosy, and that none of them have proved it, and further that a deal of work remains to be done.

Digitized by Google

Bibliography.

1. Bayon. *B. M. J.*, 1911. II. 1269.
2. Bayon. *B. M. J.* 1913. I. 424.
3. Bayon. *B. M. J.* 1912. II. 1191.
4. Bayon. *Berl Klin. Woch.* 1912. XLIL. 768.
5. Clegg. *Philippine Journal of Science.* 1909. IV. 403.
6. Clegg and Holman. Studies in Leprosy. U. S. Public Health Service. Nos. XIII, XIV, XV, XVI, XVII.
7. Duval. *Journ. Exp. Med.* 1910. XII. 649.
8. Duval. *Ibid.* 1911. XIII. 365.
9. Duval. *Ibid.* 1911. XIII. 576.
10. Duval. *B. M. J.* 1911. II. 1189.
11. Duval and Couret. *Journ. Exp. Med.* 1913. XV. 292.
Duval and Wellman. *J. Trop. Med.*. Vol. XV. 221.
12. Frazer and Fletcher. *Lancet.* 1913. Sept. 27. 918.
13. Jeanselme. *Presse Med.* 1912. 1912. No. 61, p. 629.
14. Liston and Williams. Scient. Mem. by officers of Med. and San. Dept. Govt. India. No. 51.
15. Reenstjerna. *Deutsch. Med. Wochsch.* 1912. p. 1784.
16. Wherry. *J. Infect. Dis.* 1913. XIII 144.

Digitized by Google

A CASE OF DHOBIE ITCH (TINEA CRURIS)

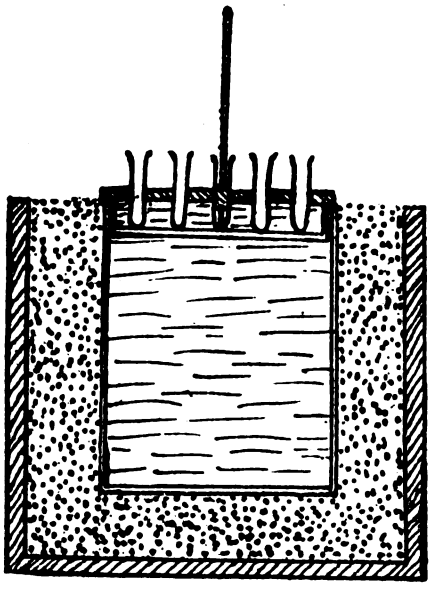
With Notes on the Thermal Deathpoint, Gross and Microscopical Drawings of the Causal Fungus (Epidermophyton Rubrum).

By WM. LOUIS CULPEPPER, B. S.,
New Orleans.

Apparatus—This consisted of a water bath constructed very much like the one used in the "Methods of Standardizing Disinfectants" by the U. S. Hygienic Laboratory, which is made as follows: A 14-quart agate-ware pail 10 inches deep is placed inside a wooden box 20 inches deep, 21 inches long and 21 inches wide. Sawdust is well packed around this, sufficient being placed on the bottom of the box to bring the rim of the pail on a level with the top of the box. A tight-fitting wooden cover is placed over the pail so that the edges project over the rim. In the cover are a sufficient number of holes (five) to hold ordinary test-tubes containing the fungus, sterile water and thermometer. The tubes are fitted into these holes and the middle one filled with water and plugged with a cork, through which a hole large enough to accommodate a thermometer is bored. The proper end of the thermometer is submerged in the tube and then about 2.5 inches of the tube submerged in the water which the pail contains. Three inches below the brim of the pail a false wire gauze bottom is placed. On this the test-tubes rest, being about half under water. The pail is filled with water to within half an inch of the top, using a different temperature with each experiment, as will be seen in the table given.

A fourteen-day culture of the fungus was used to make the following experiment: Into each of four test-tubes were put 3 cc. of sterile water and a piece of Sabouraud's medium the size of a No. 7 bird shot, which contained the growth. These were then placed in the incubator for one hour, so as to keep the water in them at 37° C. until ready for use. Water was then heated to 50° C. and poured into the pail prepared in the

Digitized by Google



CROSS SECTION OF APPARATUS

apparatus and allowed to stand ten minutes to see if it retained the proper temperature (50° C.) in the apparatus. If not, then by the addition of hot or cold water to it, as indicated, the desired temperature may be had, which will remain at that point for some hours. Having regulated this, the first lot of four tubes were put in their proper places and allowed to remain for one minute, in the first experiment, the water in the tubes being at 37° C., as stated previously. The small piece of medium containing the fungus is then removed and planted on Sabouraud's medium with three loops of the water in which it was tested; then incubated for thirty days at 37° C., keeping close watch on it for viability.

In this instance the result was a growth in seven days. This procedure was repeated three times. The second time water at 60° C. was used; the third time water at 70° C., and the fourth time water at 80° C. In each experiment the length of time the fungus was exposed to the water at the different temperatures was one, three, five and ten minutes, respectively, finally

Digitized by Google

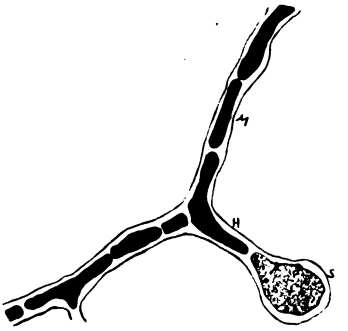
determining the deathpoint, which is 80° C., for ten minutes. The following table shows the tabulated results:

Epidermophyton Rubrum	Growth of Culture	Temp. of Water	Length of Time Exposed	Days incubated at 37°C.	Viability	Days Growth—First Showed Signs and Viability
	14 day	50°C.	1 minute	30 days	+	7 days
	"	"	3 "	"	+	"
	"	"	5 "	"	+	"
	"	"	10 "	"	+	"
	"	60°C.	1 "	"	+	"
	"	"	3 "	"	+	"
	"	"	5 "	"	+	"
	"	"	10 "	"	+	8 days
	"	70°C.	1 "	"	+	"
	"	"	3 "	"	+	"
	"	"	5 "	"	+	9 days
	"	"	10 "	"	+	13 "
	"	80°C.	1 "	"	+	11 "
	"	"	3 "	"	+	16 "
	"	"	5 "	"	+	20 "
	"	"	10 "	"	—	No growth

Accurate microscopical drawings were made with the aid of a Zeiss camera lucida.

The author wishes to state that he has made numerous attempts to infect guinea pigs, rabbits and white mice, but without success. Also, on December 2, 1913, he inoculated himself on the forearm by scarifying a place with a scalpel and rubbing the fungus on it. On December 10 a small lesion resembling that of ringworm was noticeable, but it offered no discomfort of any kind. On December 20 the lesion appeared to be about the same size as when noticed on the 10th, or perhaps a little longer, of an irregular, abrupt form, angry red color and somewhat elevated around the edges, resembling that described in Castellani and Chalmers. A number of scales were taken from the lesion and planted on Sabouraud's medium on December 21 and incubated at 37° C. On December 29 a growth appeared around one of the scales. This was closely watched and allowed to incubate until January 5, 1914. It showed the same char-

Digitized by Google



Epidermophyton Rubrum (Magnified 450X)
Stained With Loeffler's Methylene Blue

M = Mycelium
H = Hypha
C = Conidium
S = Sporangium

W.L.C.

Mycelium
Magnified 400 X
WLC

Growth in Test Tube
S- Sabouraud's Agar
D- Duval
R- Radiations

W.L.C.

Conidium Expelling Spores.
Magnified 950 X WLC

Digitized by Google

Digitized by Google

acteristics as described in *The American Journal of Tropical Diseases and Preventive Medicine* (Vol. 1, No. 5, Nov., 1913, page 400), irregular, round, abrupt, elevated edge, which was markedly red and injected. It showed close-set papules when examined with a lens. A smear was made from this growth in the usual manner and stained with Lœffler's methylene blue, which showed, upon microscopical examination, that the fungus was present. Those taken from me appeared to grow much better on the media than some taken from an old culture.

On December 23 I treated the lesion on my arm with 80 per cent carbolic acid, taking in a small part of the healthy tissue around it. At present, January 21, the lesion has healed, leaving a small white scar, but with no trace of the disease.

Digitized by Google

NEWS AND COMMENT

The eleventh annual meeting of the American Society of Tropical Medicine will be held in Boston on Friday and Saturday, May 29 and 30, 1914.

Colonel W. C. Gorgas has been elected a fellow of the Royal Sanitary Institute of London.

A course in tropical medicine has been started at Johns Hopkins Medical School, with Dr. A. W. Sellards in charge.

Dr. Claude C. Pierce has resigned as superintendent of the Colon, Canal Zone, Hospital, and has returned to the United States to resume his duties with the service.

Dr. Donald H. Currie, U. S. P. H. S., has been appointed a member of the California State Board of Health and elected secretary to fill the vacancy caused by the resignation of Dr. William F. Snow.

Within the last three years twenty-two cases of beriberi have occurred in the county jail at Elizabeth, N. J. At one time all inmates serving terms of over sixty days were found to have the disease.

A bill providing for an initial appropriation of $25,000 for the establishment of a state hospital for the study and treatment of pellagra in South Carolina has been passed by the senate and finance committee.

The American Social Hygiene Association came into existence on February 9 as the successor to the American Federation for Sex Hygiene and the American Vigilance Association. The headquarters of the association are at 105 East Fortieth Street, New York City.

Digitized by Google

A diploma in tropical medicine will be given at the University of Sydney following a three months' course in tropical pathology, parasitology, bacteriology, hygiene and sanitation, and tropical medicine. The course is open to qualified medical practitioners having a twelve months' standing.

At the sixth Medical Pan-American Congress held in Lima, Peru, it was decided to erect a monument in memory of Daniel A. Carrion, martyr of the medical science of Peru. Subscriptions from the United States should be sent to Lieut-Col. Charles F. Mason, Medical Corps, U. S. Army, Ancon Hospital, Ancon, C. Z.

Dr. S. Josephine Baker, chief of the Bureau of Child Hygiene of New York City, believes that the decrease in the death rate of children under one year of age from 14,269 in 1912 to 13,772 in 1913 is largely due to the organized education of parents carried on by the infant welfare organizations of New York.

The Baltimore Health Department is to be divided into bureaus in order to facilitate the work of the preservation of the public health. The Bureau of Food and Dairy Inspection has already been organized, and among the other bureaus are to be those of sanitation and plumbing, infectious diseases, vital statistics and laboratories.

Colonel William C. Gorgas has been appointed Surgeon-General in the U. S. Army by President Wilson to succeed the late General Torney. Colonel Gorgas has been an officer of the Army Medical Corps since 1885, reaching the rank of colonel in March, 1913. This new promotion is in recognition of the magnificent work done by Colonel Gorgas and his staff in the sanitation of the Panama Canal Zone.

On account of the smallpox epidemic in Niagara Falls, N. Y., the Department of Public Health of Canada has issued instructions to its inspectors to prohibit any citizen of that city boarding a train for Canada unless he is able to produce a certificate

Digitized by Google

of recent vaccination. The New York State Board of Health is urging the vaccination of all children in the public schools of the city.

An interesting report has just been issued by the Bombay Bacteriological Laboratory for 1912. It shows that 70,000 doses of anti-plague vaccine were distributed during the year through India, China, Africa and Java. Investigation into the transfer of plague infection in grain, as well as many other investigations and experiments, show that progress is being made in India along the line of preventive medicine.

The tenth annual conference of the Councils on Medical Education and Medical Legislation of the American Medical Association was held in Chicago, February 23 and 24, 1914. Among the papers read at the conference of the Council on Health and Public Instructions were "Recent Efforts for Sex Education," by Dr. William F. Snow; "Public Education Through the Daily Press," by Dr. J. W. Pettit, and "Public Education Through State and County Boards," by Dr. W. S. Rankin.

At a recent conference held in New York, Dr. Herman M. Biggs, State Commissioner of Health of New York, presented statistics showing the increase in the death rate in the rural districts and the decrease in the death rate in the cities. Dr. Biggs pointed out that in the country each farm owner must furnish his own means of water supply and sewage disposal, while in the cities the health departments provide these for the residents. He thinks that if a division of rural hygiene were established, to have charge of the sanitation of the rural districts, the death rate would be materially lowered.

A "Life Extension Institute" has been incorporated in New York, with Ex-President Taft as chairman and Colonel W. C. Gorgas as consultant in sanitation and hygiene. As the title designates, the corporation will have as its end the lengthening of human life. The institute will coöperate with insurance companies and the general public by the periodical examination of the stockholders and others and the distribution of knowledge

Digitized by Google

regarding the saving of human lives. The corporation plans to establish relations with schools, boards of health, industrial establishments and all agencies pertaining to the preservation of public health.

A bill has been proposed in France to make anti-typhoid vaccination compulsory in the army. There has been much opposition to the bill, however, on the ground that soldiers should not be compelled to submit to a vaccination from which the citizens are exempt. A French soldier, who is in a great number of cases a minor, could not be vaccinated if a certificate were received from his father stating his unwillingness to allow his son to submit to this. Naturally, many difficulties would arise for the physicians instructed to carry out this law. While optional antityphoid vaccination is gaining favor in the army, it is feared that if it were made compulsory only opposition and bad results would follow.

PUBLIC HEALTH ACTIVITY.

IDAHO.—(Bulletin, January 25, 1914)—Conclusions upon wrapped bread and unwrapped bread show of unwrapped bread 39 per cent dirty (bacterial average, 14,000; maximum, 120,000); 39 per cent fair (bacterial average, 4,000; maximum, 20,000); 22 per cent clean (bacterial average, 2,500; maximum, 14,000). Of wrapped bread, 45 per cent was fair (bacterial average, 848; maximum, 3,000) and 35 per cent was clean (bacterial average, 371; maximum, 2,200. A few of the bacteria found were possible disease producers. (Report quoted from Evans, of Chicago.)

OHIO.—*Cincinnati* (Report of January 24, 1914)—529 cases of smallpox were reported from thirty-two counties during December. Six of the 529 cases had been vaccinated. The disease prevailing is of moderate virulence.

Cleveland—Epidemiology of whooping cough, measles, scarlet fever and diphtheria. From the study of one year's observations in the incidence of these diseases a group of students

Digitized by Google

working in the laboratories and through the public health office of Cleveland have drawn the following general conclusions: The more crowded schools have had the more incidence. Measles and scarlet fever were seasonal, associated with school periods. Diphtheria was general and whooping cough was mostly in children under school ages. The cases studied were of whooping cough, 607; measles, 2,278; scarlet fever, 1,506; diphtheria, 2,604. The incidence per thousand in public schools is 27.2; in parochial schools, 17; in other schools, 35.

NEW YORK.—(December Bulletin, 1913)—Infant welfare stations in New York: Eleven cities and one village, excluding New York City, have established infant milk stations; the total number of stations is thirty-two. Other cities and villages have been active in infant welfare work. While the sale of milk is active at these stations, the nurses also examine babies, visit them at their homes and anticipate expected service by providing themselves with lists of births in their districts, so that prompt visits may be made to those homes where the services of the nurses would be obviously needed. The stations are largely supported by private funds, but in some cities their operation is put upon the same basis of budget as the public schools.

ILLINOIS.—(*Institution Quarterly*)—Deporting alien insane: Under the present state laws, Illinois provides for a deportation agent whose function it is to visit insane persons committed and to gather all information determining residence. All aliens are returned to the states of their original residence after due notice; claim for expenses incurred is also made.

ISTHMIAN CANAL COMMISSION.—For November, 1913, the death rate among employees was 4.89 from diseas and 5.12 from violence. The death rate in the cities of Panama, Colon and the Canal Zone for all persons for November was 27.94. There were forty-six lepers at the end of November in the Palo Seco leper asylum, four whites and forty-two blacks.

TEXAS AND MICHIGAN now issue elaborate bulletins. These two states have presented current publications carrying a va-

Digitized by Google

riety of topics of import and interest to the general reader as well as to the physician engaged in public health work. These bulletins open up excellent media for the propaganda in preventive medicine. Exchanges are freely and fully used for articles and abstracts.

MISCELLANEOUS.—It is estimated that, in the civilized world, one baby dies every ten seconds, 360 every hour, 8,640 every day, 3,053,600 every year. Over one-half of these deaths could be prevented.

HEALTH REPORT OF NEW ORLEANS for the month of January, 1914: The following is a digest of the report of the superintendent for the month of January past: Population of New Orleans (estimated), 373,000 (272,000 white, 101,000 colored). Average daily water consumption, 23,501,000 gallons. Number of miles of sewer mains laid, 464. Number of premises connected with sewers, 42,020. Total deaths, 676. Deaths in hospitals and institutions, 202. Death rate per thousand per annum for the month, white, 18.39; colored, 30.77; total average, 21.75. Death rate for the year 1913, 18.98 (white, 14.94; colored, 29.95).

Digitized by Google

CURRENT LITERATURE

Trypanosoma Americanum.—(*New Orleans Med. and Surg. Jour., Vol. 66, No. 7, an.*, 1914.) F. M. Johns, in an interesting article, gives us an insight into valuable knowledge concerning trypanosomes. This organism infests our cattle, its presence having no deleterious effect on them, and can be artificially cultivated. It offers exceptional possibilities for experimentation on account of its widespread presence, which will probably lead us to some better understanding concerning our more parasitic species. An important factor revealed is that if fresh serum is added to the culture, they are quickly destroyed, due to its complement content. The above probably takes place in the stomach of insects unable to transmit trypanosomiasis, on account of their voracious feeding habits. *P. L. Querens.*

Epidemic Cerebro-Spinal Meningitis in Nairobi.—Transactions of the Society of Tropical Medicine and Hygiene. Vol. VII, No. 2, Dec., 1913.) Shircore and Ross record practically the first epidemic of Cerebro-Spinal Meningitis due to the *Diplococcus intracellularis*, in the region of Nairobi. This is very important, as regards the epidemiology of this disease, for it is rapidly invading new centers. Among the interesting features is the peculiar abberrant types met with, for none showed the rash, a valuable sign, and herpes appeared in only 5 per cent of the cases. The diagnosis was made by lumbar puncture, the greatest number showing the gram negative diplococci. The method of fixing the smears, found to be the most suitable, was to air dry, then fix with absolute alcohol. Soamin was proved to be of great value and considered as being almost a specific. The serum treatment was not endorsed, probably on account of the effect of the lengthy time of transportation which possibly results in its deterioration. *P. L. Querens.*

Mosquito Reduction and the Consequent Eradication of Malaria.—(Transactions of the Society of Tropical Medicine and Hygiene, Dec., 1913, Vol. VII, No. 2.) Malcolm Watson, in his recent address before the above society, discussed what can be done by physicians and public health officers in aiding the effacement of our most common tropical malady—malaria. Anyone with even limited outlay can undertake this hygienic problem, and the only prerequisite is experience; of course, considerable knowledge of the character of land with which we are dealing is of supreme importance in connection with the obstacles that inevitably arise, also the outlay concerned may even be vast in some cases, but quinine, plus the cost of human life and suffering, inevitably costs more. Even the cleaning of the jungles within one thousand feet of the dwellings has greatly reduced the mortality, and in cases cited by the author the "spleen rate" in some districts was reduced to nil. Drainage is by far the most efficacious method, as time has proven, but in certain districts we must admit of this impossibility, thereby

Digitized by Google

having to resort to oil and cleaning. We advise reading the article by all those interested, as it is concerned with one of our gigantic problems of to-day in regarding it from the standpoint of preventive medicine. The paper was admirably discussed by Sir Ronald Ross, Drs. Thomas, Balfour, Low and Bahr. *P. L. Querens.*

The Conservation of Public Health.—(Monthly Bulletin of the Ohio State Board of Health.) E. F. McCampbell brings out the fact that practically all religions in the early days gave attention to preventive medicine. He cites especially the laws of Moses in regard to hygiene and sanitation as well as to diet; the teachings of Mohammed, calling attention to the necessity of cleanliness in the prevention of pestilence, and the laws of Buddha and Confucius. For a time instruction in hygiene was disregarded by the churches, but they are again coming to the front in this work. Much is being done along this line by the Young Men's Christian Association and the Young Women's Christian Association, as well as by other religious clubs and societies. Dr. McCampbell thinks that the solution of the problem of preventable diseases lies in the education of the people in the proper methods of right living. He says, however, that this statement needs some restriction. Education and environment can do a great deal in improving the conditions of mankind, but they cannot have absolute power over the body that has been weakened by heredity. Though a child may be born without an actual disease, a weak constitution and defective mental ability may be the predisposing cause of much future illness. This naturally brings up the necessity of educating the parents, not only in regard to the care of their child, but, going further back than that, in regard to questions of right living, that the child may come into the world with a healthy body and sound mind. The author takes up various aspects of the work of the Ohio State Board of Health, such as medical inspection of school children, the purification of the water supplies and the work of the Division of Occupational Diseases. *Eds.*

Antityphoid Vaccination.—(*American Journal of the Medical Sciences,* Dec., 1913, No. 6. Vol. CXLVI, p. 803.) Frederick F. Russell, M. D., Major in Medical Corps, U. S. Army, writing from Washington, D. C., gives not only a history of antityphoid vaccination in this country and abroad, but also gives the results of same in the United States Army up to and including October, 1913. There is no more striking example of what can be accomplished by preventive medicine than can be found in the statistics embodied in this paper. In March, 1911, the army was concentrated in Texas along the Mexican border for field manœuvres. Never before since the Spanish-American War had so many United States troops been congregated in camp, and an order recommended by Surgeon-General George H. Torney and approved by the War Department, March 9, 1911, requiring the vaccination against typhoid of all troops on the border, has been epoch-making. In all, 60,000 doses of vaccine were given with no ill effects, allow-

Digitized by Google

ing a comparison with former encampments in which no such precautions were taken. During the Spanish-American War there were concentrated at Jacksonville, in 1898, 10,759 troops, with 2,500 cases of typhoid fever and 248 deaths from this disease; at San Antonio, in 1911, 12,801 troops were assembled, with only two cases of typhoid fever and no deaths. The troops were in camp approximately the same length of time, in the same latitude and under the same general sanitary surroundings and water supplies. At the time of the San Antonio encampment there were reported 49 cases of typhoid fever with 19 deaths among the civil population, and as the troops mingled freely with the latter, there is no reason to suspect lack of contamination as a cause for the low morbidity. The results were so striking that it led to the passage of an order requiring all enlisted men in the United States Army to be vaccinated and the prompt vaccination of all recruits. What this order has accomplished can best be judged from the following statistics:

	Total	Total	Infected prior	Among the vaccinated.	
Year.	Cases.	Deaths.	to enlistment.	No. of cases.	No. of deaths.
1909.....	173	16	?	1	0
1910.....	129	9	?	4	0
1911.....	44	6	?	7	0
1912.....	18	3	5	6	0

Up to October 1, 1913, Russell states that there had been not a single case of typhoid fever reported. This Journal has since learned (telegram from Acting Surgeon-General Charles M. Gandy) that during the entire year 1913 there were but four cases of typhoid fever, two recruits not vaccinated and two vaccinated, but, as far as can be learned, with no deaths. Such results as these should silence permanently all agitation against vaccination. Russell also claims that results disprove the existence of a *negative* phase in antityphoid vaccination, which will materially assist in popularizing the general vaccination against typhoid fever. As vaccine, one strain (Rawling's) grown for eighteen hours on agar and washed off with a little sterile saline solution, was used. The thick emulsion obtained is heated in a water bath for one hour at 53 to 64 degrees C., diluted with large quantities of salt solution until the desired concentration, 1,000,000,000 to the cubic centimeter, is obtained. Finally 0.25 per cent of trikresol is added as a matter of safety. After aërobic, anaërobic and animal tests have been made, the vaccine is put up for shipment in hermetically sealed ampules of normal glass. Good antityphoid vaccine can be secured readily on the open market, and laymen are beginning to realize its value, so that it is to be hoped that before long the work of Russell will have made typhoid fever a rare disease. *Allan Eustis.*

Intestinal Flora of the Adult Stegomyia fasciata.— (*Bulletin de la Société de Pathologie Exotique*, No. 10, 1913.) Drs. F. Noe and L. Stèvenel remind us that attention has already been drawn to a certain number of organisms found in the digestive tract of the *Stegomyia fasciata*, exam-

Digitized by Google

ined in the course of its natural life. These are usually fungi allied to the Mucors (Marchoux, Salimbeni and Simond), parasites which can invade all parts of the body of the mosquito, and cause death, and also to the yeasts, observed by the same authors, varying according to the character of the food, whether honey, fruits, or other saccharine material, and one species of which, *Saccharomyces apiculatus*, was a cause of error on the part of Parker, Beyer and Pothier in their investigations on the parasite of yellow fever. Marchoux, Simond and Salimbeni have also studied microsporidia of the genus *Nosema* and *Gregarines* of the malpighian tube, the free phase of which is seen in the digestive tube. The invasion of the embryos of the *Filaria bancrofti* is well known; and also those of the *Dirofilaria repens*, which has recently been studied by N. Bornard and Bauche. To this list must be added the *Septomonas algeriense*, studied by Ed. and Et. Sergent in 1906, and also a culture of *Leishmania tropica* introduced experimentally by Wenyon. The study of the relation of the Stegomyia to yellow fever led Noc and Stèvenel to examine the intestinal flora of a number of these insects. It will be recalled that some authors, notably Patrick Manson, have expressed the view that the parasite of yellow fever, supposed to be a protozoön, might be visible in the mosquito, even though invisible in human blood. Schaudinn has even surmised that this parasite might be an extremely small spirochete, similar to the spirochetes derived from the *Plasmodium ziemanni*. Reasoning along these lines, it occurred to them that a thorough study of the intestinal flora of an adult Stegomyia in the fasting state should precede that of the mosquito after having drawn blood from a yellow fever patient. The insects, after being freed from their legs and wings, were dissected in a drop of sterile water, and the digestive tube was placed on a slide in another drop of sterilized water, and thence transferred to a clean, dry slide on which the middle and anterior gut were rapidly spread out with a fine needle, then separated, fixed in absolute alcohol, and stained for twenty-four hours in Giemsa diluted ten times. All mosquitoes were rejected in which the intestine could not be isolated satisfactorily. Among thirty female Stegomyias that had never drawn blood, and that were examined at various times after hatching out, only nine had a visible intestinal flora. They observed the following: Once, a small flagellate three or four micra long and one and a half to two micra wide, resembling the Crithidia found by Léger in the intestines of female Anopheles in Dauphiny. Twice they found yeasts. Once, yeasts and sporulating bacteria. Twice, yeasts and fine cocco-bacilli. Once, a spirochete presenting the dimensions and appearance of the *Spirocheta refringens*. Once, five cocco-bacilli, ovoid bodies provided with two chromatin granules, having one extremity truncated, which they could not identify; and in the same preparation, fine and short spirilli (one turn and a half of spiral), and some larger and coarser spirilla (two to four turns); these were from one-quarter to one-half of a micron in width, and two to four micra in length. Besides their fineness

Digitized by Google

in a dry and stained state, and the existence of these bodies of variable size, they also noted the feeble staining after twenty-four hours of contact with the Giemsa. The Stegomyias that were carriers of yeasts and sporulating bacteria had been fed on honey, and the carrier of these microspirilla was newly hatched out and had never taken any food. The other twenty-one adult Stegomyias, having never sucked blood, did not have a visible intestinal flora. Furthermore, they examined eleven Stegomyias that had previously drawn blood from yellow fever patients, or captured in the sickroom; they found only a common intestinal flora, and that only in five of the mosquitoes. The results were as follows: Once, staphylococci and a sporulating bacterium; once, sporulating bacteria only; twice, numerous fine bacilli; once, yeasts. The six other specimens that had drawn blood showed no visible intestinal flora. It would be interesting to continue the investigation into the intestinal flora of the adult *Stegomyia fasciata.*

A. McShane.

Concerning the Beriberi-Preventing Substances or Vitamines Contained in Rice Polishings.—(*The Philippine Journal of Science,* No. 3, Vol. VIII, June, 1913.) Vedder and Williams present strong evidence that rice contains at least two different neuritis-preventing substances, and by the curative action of these substances on differen forms of beriberi in man they consider a previously expressed hypothesis supported. This hypothesis stated by Vedder and Clark is that wet beriberi and dry beriberi are two distinct conditions and caused by deficiency of a separate vitamine.

C. C. Bass.

Intestinal Parasites Encountered in Five Hundred Autopsies, with Reports of Cases.—(*The Philippine Journal of Science,* No. 3, Vol. VIII, June, 1913.) Crowell and Hammack summarize the findings at autopsy on Filipinos, Americans, Europeans, Chinese, Japanes and East Indians autopsied in the Philippines. The period of residence in the Philippines was varied. The infections found in the 500 autopsies were *Ascaris lumbricoides,* 41.2 per cent; *Trichuris trichiura,* 34.4 per cent; hookworms, 16.6 per cent; *Tenia saginata,* 0.2 per cent; *Cysticercus cellulosae,* 0.2 per cent; *Oxyuris,* 1 per cent; *Clonorchis sinensis,* 0.4 per cent; *Schistosoma japonicum,* 0.2 per cent. *C. C. Bass.*

Experimental Balantidiasis.—(*Ibid,* No. 5, Vol. VIII.) Walker concludes that *Balantidium coli suis* and *Balantidium coli hominis* are identical and that the source of infection to man in the Philippine Islands is the domesticated pig. He was able to parasitize 70.5 per cent of seventeen monkeys fed or injected rectally with either *Balantidium coli hominis* or *Balantidium coli suis.* *C. C. Bass.*

Experimental Entamebic Dysentery.—(*The Philippine Journal of Science,* No. 4, Vol. VIII, Aug., 1913.) Ernest Linwood Walker and Andrew

Digitized by Google

Watson Sellards present an extensive study of the subject. Their work is divided into six parts: I. Introduction. II. Feeding experiments with cultures of *Amebae.* III. Feeding experiments with *Entameba coli.* IV. Feeding experiments with "*Entameba tetragena*" and *Entameba histolytica.* V. Application of the results to the diagnosis, treatment, and prophylaxis of entamebic dysentery. VI. Summary and conclusions. They experimented on prisoners in the Bilibid Prison, Manila, by feeding stools or cultures, usually in gelatin capsules. The acidity of the stomach contents was usually neutralized with magnesium oxide fed with the infected material. They experimented with both *Amebae* and *Entamebae,* and, in all, sixty feeding experiments were made. Thirteen strains and eight species of ameba cultivated from various sources—Manila water supply, stools of healthy persons, dysenteric stools, etc.—were fed to twenty men. The amebæ were recovered in cultures made during a few days subsequent to the feedings, but they were never demonstrable in the stools microscopically and not a single man became parasitized; none developed dysentery. The conclusion is drawn from these experiments that "(a) The cultivable *Amebae* are incapable of living parasitically in the intestinal tract of man." "(b) The *Amebae,* when obtained in cultures from stools, intestinal contents, or liver abscess pus, are derived either from cultural contaminations or from encysted *Amebae* which have been ingested with water or food and have passed unchanged through the intestinal tract." "(c) The cultivable *Amebae* are nonpathogenic, and consequently play no rôle in the etiology of endemic tropical dysentery." Fine different strains of *Entameba coli* were fed to twenty men. Seventeen became parasitized in an average of 4.7 days. The *Entameba coli* could be demonstrated by microscopic examination of the stools in every case parasitized and cultures were uniformly negative. None of the parasitized men developed dysentery. From these experiments it is concluded that: "(a) *Entameba coli,* unlike the *Amebae,* is a strict or obligatory parasite and cannot be cultivated on Musgrave and Clegg's medium." "(b) *Entameba coli* is nonpathogenic, and consequently plays no rôle in the etiology of endemic tropical dysentery." *Entameba histolytica* was fed to twenty volunteers, of whom eighteen became parasitized, the average incubation period being nine days. Of these, four have developed entamebic dysentery in an average of 64.8 days from date of inoculation. They fed so-called *Entameba tetragena* cysts and patients became parasitized with typical *Entameba histolytica,* indicating that they are different phases of the same parasite. It is particularly interesting that all the successful infections were with material from "carriers" and not from acute dysentery or liver abscess cases. In fact, it is only the cysts that infect, and motile *Entameba* seem to be harmless. The conclusions drawn are that: "(a) *Entameba histolytica,* like *Entameba coli* and in contrast to *Amebae,* is a strict or obligatory parasite and cannot be cultivated on Musgrave and Clegg's medium." "(b) '*Entameba tetragena*' Vierick is identical with *Entameba histolytica*

Digitized by Google

Schaudinn, and *'tetragena'* cysts are developed in the life cycle of *Entameba histolytica.''* ''(c) The large percentage of latent infections obtained in these experiments is wholly consistent with our clinical and pathological experience with entamebic dysentery.'' ''(d) *Entameba histolytica* is the essential factor in endemic tropical dysentery.'' The authors believe that ''carriers'' who perhaps have never had dysentery are the only source of infection and perpetuation of the species, and recommend that prophylactic measures should be directed toward carriers whose occupations make them especially likely to be a source of infection. *C. C. Bass.*

Thymol as a Remedy for Tapeworm.—Dr. Artault, of Vevey (*Bulletin de Thérapeutique*), reports the results obtained from the use of thymol in tapeworm. The remedy acted so promptly and was so easy to administer that he had abandoned all other remedies since 1907. Artault employs the crystallized thymol, in capsules (or *cachets*), containing twenty-five centigrams each, before breakfast every morning for several days. The tapeworm, as a general rule, is expelled on the third or fourth day; but Artault continues the treatment for eight days in order to make sure that the work is done well. The treatment is so simple, the tolerance of the patient is so complete, and the inconveniences are so trifling that Dr. Artault does not hesitate to hail it as the treatment *par excellence.* Artault has thus cured twenty-three cases without a single relapse, and he believes that all physicians will adopt this treatment as soon as they realize its advantages, on account of its mildness and on account of the complete absence of annoyance to the patient, whose only precaution is to abstain from alcoholic beverages during the continuance of the treatment.—*Revista de Medicina Y Cirugia de la Habana.* *McShane.*

Luetin.—The *Gaceta Medica de Costa Rica, Nov.* 15, 1913, contains a brief biographical sketch of the eminent Japanese scientist, Hideyo Noguchi, together with a résumé of three of his principal achievements, the luetin reaction (anti-reaction of syphilis), the cultivation of the *treponema pallidum*, and general paralysis and syphilis.

The local reaction, based on supersensibility, which was first utilized by von Pirquet and called *allergy*, seems to develop in certain infectious diseases, like syphilis and tuberculosis. But before undertaking this test, it is necessary to obtain the constituent principles of the infecting micro-organism in a pure and sufficiently concentrated form. This explains why the reagent should be extracted from material obtained from pure cultures of the micro-organism, that is, from pure cultures.

In regard to syphilis, some authors saw the possibility of obtaining an anti-reaction, which was not realized for lack of pure cultures, which were only obtained by Noguchi in 1911. Many investigators have taken up this question, but the results are not uniform, probably on account of the impurity of the material employed. When pure cultures were finally obtained studies in immunity and anaphylaxis were begun.

Digitized by Google

Luetin is prepared in the following manner: The pure cultures of the treponema are gathered in a sterilized mortar and ground up finely, in order to obtain an extract free from foreign matter. The emulsion that results from this proceeding ought to be perfectly liquid, and for this purpose a sufficient quantity of liquid culture-medium is added. The emulsion is heated to 60 degrees C. for thirty minutes. The luetin thus prepared always contains six different strains of the treponema pallidum. In order to increase the polyvalence it is necessary to employ as many strains as possible.

At the time of using, the luetin is diluted with some sterilized artificial serum.

The luetin is injected into the *derma* of the right arm. The quantity employed varies from 5 centigrams for a child to .07 for an adult. A small whitish spot quickly appears, but disappears in about ten minutes.

The injection might have either a *positive* or a *negative* result. When it is *negative* there occurs at the seat of the injection in twenty-four hours a slight erythema, which disappears at the end of forty-eight hours. Sometimes, at the end of twenty-four hours, there is observed a hard, distinctly elevated papule, surrounded by a zone of erythema more or less intense; this papule gradually diminishes and disappears on the fifth day, leaving only a slight pigmentation. A *positive* reaction may show itself under three forms: *Papular, pustular* and *torpid*, which are sufficiently designated by their respective names.

The luetin reaction produces no systemic disturbance except an occasional slight elevation of temperature. This reaction is useful in revealing the existence of syphilis in a chronic or latent state, in which the clinical symptoms of the Wasserman reaction are absent. A negative luetin-reaction in chronic cases of syphilis in which the symptoms are grave and the Wasserman reaction evident, indicates unfavorable prognosis. Such is frequently the case in individuals suffering from general paralysis.

Another contribution to the literature of luetin appears in the *Deutsche Medizinsche Zeitung*, Dec. 20, 1913, abstracted from the *Journ. Med. de Bruxelles*, No. 42, 1913. Dr. J. Desneux reports the results of its use in two hundred persons. He used as controls the culture-fluids devoid of spirochætæ.

The luetin was diluted with an equal bulk of physiological saline solution and injected in doses of .07 of a cubic centimeter. The positive reaction showed itself under three forms: Papular, pustular and latent, the last being recognized by the fact that the papules or pustules do not appear before a period of latency of ten or fifteen days have elapsed. The results speak in favor of the availability of luetin as a means of diagnosis, even though various authors look upon the spirochetes cultivated by Noguchi as a saprophytic form. Healthy individuals, non-syphilitics, syphilitics in the primary and secondary stages, and patients with parasyphilitic affections did not react to luetin; whilst patients with tertiary manifestations and gummata reacted almost without exception. In tertiary syphilis a

Digitized by Google

positive luetin-reaction was obtained when the Wassermann test failed. The positive occurrence of the cuti-reaction in tertiary syphilis is explained by the allergy which develops during this stage. The supersensibility of the skin to traumatisms in tertiary syphilis is remarkable. When a trauma is inflicted on a part of the skin where spirochetes are resting in a latent state, a gumma begins to form at once. There also arises a generalized cutaneous supersensibility, which explains why the intracutaneous injections of substances which are otherwise inert set up a marked reaction in tertiary syphilis; the injection of the innocuous control-fluid caused a marked reaction, but the luetin caused in these same subjects a stronger and more constant reaction. In the production of the cutireaction two factors are concerned: a non-specific culture-medium and a dead, non-specific spirochete. Luetin is also useful in the diagnosis of visceral syphilis.

McShane.

Nastin in Leprosy.—In the report for 1912, for the Sylhet Leper Asylum, in the Province of Assam, L. Bodley Scott draws the following conclusion concerning the use of Nastin in treating leprosy: Forty-nine cases were treated for periods ranging from six months to two years; average length of treatment was thirteen months. Every case was microscopically confirmed; re-examination of most cases was made during the treatment. A full tube of Nastin-B. was used at each injection; injections were given on an average of one in three weeks.

As a rule, there was no constitutional reaction and local changes were rare.

Of the forty-nine case treated, the results were as follows: Cured, 8; greatly improved, 12; considerably improved, 12; somewhat improved, 10; stationary, 2; worse, 5; total, 49.

Those cases treated over one year showed most improvement. The term "cure" employed here is defined by the narrator as meaning "complete restoration to health, strength and working power, with loss of all troublesome or crippling symptoms," but he does not mean that all symptoms, clinical and microscopical, were obliterated.

The general conclusion drawn would point to a considerable value in Nastin as a remedy for leprosy, but that its entire efficacy is not yet sufficiently proven to argue it as a supreme remedy. *Dyer.*

Digitized by Google

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed.

BOOKS.

Practical Study of Malaria. By William H. Deaderick, M. D. Philadelphia: W. B. Saunders Company.

This is one of the most complete discussions of the subject that has ever appeared. It is what the title implies—a practical study of malaria—and is written by one who has had extensive practical experience largely as a general country practitioner. The illustrations are largely original and mostly extra good. The extent to which the author has consulted other authorities is shown by the long list of 449 references given at the end of the volume. This will serve as an excellent bibliography of the subject. The author is to be congratulated upon his full discussion of "blackwater fever" and the correctness of his views. *C. C. Bass.*

Pellagra. By George M. Niles, M. D., Professor of Gastro-enterology and Therapeutics in the Atlanta School of Medicine, Atlanta, Georgia. Philadelphia: W. B. Saunders Company, 1912.

The author discusses the subject freely, giving briefly the many theories and ideas advanced as to etiology, and confessing in the preface that the "last word" on pellagra has not been said. He closes the chapter on etiology with a statement of Lombroso's theory. "In pellagra, then, we are dealing with an intoxication produced by poisons developed in spoiled corn through the action of certain microörganisms in themselves harmless to man." The chapter on symptomatology emphasizes the very variable symptoms of the disease. Treatment is discussed under the heads Dietetic, Hygienic, Hydrotherapeutic and Medicinal. The multiplicity of measures recommended to be tried serve to detract somewhat from the emphasis that should be laid upon the certainly beneficial measures; viz, diet, protection from light and change of climate and environment whenever practical. The book is somewhat marred by a number of poor pictures. *C. C. Bass.*

A Manual of Personal Hygiene. By American authors. Edited by Walter L. Pyle, A. M., M. D. Fifth edition, revised and enlarged. W. B. Sanders & Co., Philadelphia and London. 1913.

This revised edition of a popular work on hygiene has been rearranged so as to present complete articles by a number of men qualified in each particular subject related to hygiene. While personal hygiene occupies most of the book, considerable space is given to the subject of domestic hygiene, and some casual conditions, such as poisoning, fractures and foods. The reader is advantaged by the concept of the work—taking it out of stereo-

Digitized by Google

typed lines, and altogether there is a large amount of information brought into small space. As a practical textbook, this manual will serve, while it can have no pretension to a complete presentation of the subject undertaken.

Dyer.

REPRINTS.

Chalmers, Albert J., and O'Farrell, W. R. Pyosis Tropica in the Anglo-Egyptian Sudan. Reprinted from Journal of Tropical Medicine and Hygiene. Dec. 15, 1913.

McDill, John R. Chronic Ascites: Treatment and Drainage by Lymphangioplasty Through a Trocar Wound Under Local Anæsthesia. Reprinted from Surgery, Gynecology and Obstetrics. November, 1913, pp. 523-532.

McDill, J. R. Cyst of the Fifth Metacarpal Bone. Reprinted from Annals of Surgery. October, 1913.

McDill, J. R. Status of Medical Affairs in the Philippine Islands. (Philippine Islands Medical Association, President's Annual Address, 1905.) Reprinted from A. M. A., Aug. 19, 1905, Vol. XLV, No. 8.

McDill, J. R. Tropical Infections of the Derivatives of the Primitive Gut; Their Complications and Treatment. Reprinted from Surgery, Gynecology and Obstetrics, November, 1911, pp. 523-558.

Mitzmain, M. Bruin. Mechanical Transmission of Surra by *Tabanus striatus*. Bulletin No. 28, Government of the Philippine Islands.

Neilson, Charles Hugh. Colloidal Solutions and the Therapeutic Application of Electric Colloids. Reprinted from the Interstate Med. Journal, Vol. XX, No. 1, 1913.

Neilson, C. H., and Hyland, Robert F. Effect of Strong Purging on Blood-Pressure and the Heart. Reprinted from the Journal of the A. M. A., Feb. 8, 1913, Vol. LX, pp. 436-439.

Neilson, C. H., and Bonnot, Edmond. Method for the Quantitative Determination of Pepsin by Using a Colloidal Suspension of Egg Albumin. Reprinted from the Archives of Internal Medicine, April, 1913, Vol. 11.

Neilson, C. H., and Terry, O. P. Paroxysmal Hemoglobinuria. Reprinted from the Archives of Internal Medicine, June, 1910, Vol. 5, pp. 577-582.

Schereschewsky, J. W. Heat and Infant Mortality. Reprint No. 155 from the Public Health Reports, December, 1913.

Von Ezdorf, R. H. Malarial Index Work: Methods Used in Obtaining Blood, Making Smears and Staining. Reprint No. 159 from the Public Health Reports, December 26, 1913.

Von Ezdorf, R. H. Malarial Fevers: Prevalence and Geographic Distribution in Arkansas. Reprint No. 160 from the Public Health Reports, January 2, 1914.

Wilcox, E. V., and Holt, V. S. Ornamental Hibiscus in Hawaii. Bulletin No. 29, Hawaii Agricultural Experiment Station.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CHARLES CHASSAIGNAC, M. D.
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine
JOHN M. SWAN. M. D., Secretary, American Society of Tropical Medicine } *Ex officio.*
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M. D., University of Pennsylvania
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. MARCH, 1914 NO. 9.

EDITORIAL

Oroya Fever and Peruvian Wart.—Science has its heroes and martyrs as well as religion. Recent times have produced such men as Reed, Carroll and Agramonte, who risked their lives in Havana, in 1898, in order to confirm or set aside Carlos Finlay's epochal discovery of the agency of the mosquito in transmitting yellow fever. A few years earlier, Peru furnished a man who actually lost his life in trying to clear up two of the worst afflictions of that country. Daniel Carrion inoculated himself (in 1885) with the virus of Peruvian wart in order to determine whether Oroya fever and the wart were one and the same disease. His act will ever live in the history of medicine and of his native country.

The work of Carrion seemed to settle once and for all the identity of the two diseases. However, bacteriology had not then reached the high state of development it has since attained; and many supposed discoveries have been compelled

Digitized by Google

to undergo revision. Such a fate seems to have overtaken Carrion's work, for the recent investigations of Prof. Richard P. Strong, of Harvard, throws an entirely different light on the etiology and pathology of these two diseases. He maintains that they are separate morbid entities. Furthermore, Dr. Julian Arce (in *La Cronica Medica,* of Lima, September 30, 1913), a countryman of Carrion's, who yields to no man in his appreciation of Carrion's heroism, expressed the same opinion in a thesis as far back as 1889.

Prof. Strong's investigations* were carried on in the latter part of 1913, according to the accepted standards of modern medical research. He claims to have satisfactorily determined that the two diseases, while prevailing usually in the same localities, are separate and distinct. Daniel Carrion inoculated (in 1885) both arms with the virus from a Peruvian wart; after a period of incubation of twenty-three days, he became ill with Oroya fever, and died in a few days. His contemporaries held that this established the identity of the two diseases, and called the early febrile stage, "Carrion's fever."

This view was still widely held when Prof. Strong's expedition arrived in Peru. Barton had described a bacillus in the blood of patients dying from Carrion's fever, which closely resembled the colon-bacillus. He believed that this was the cause of the disease, for he found that, when injected, it could produce a fatal septicæmia in animals, or a warty eruption on the skin. Others also found this organism, but assigned to it a place in the typhoid group, and could not produce a warty eruption with it in animals. Therefore, it was rejected as the specific cause of the disease.

Strong soon came to the conclusion that Oroya fever and

*New York Medical Journal, March 14, 1914.

Digitized by Google

verruga (wart) were different diseases. Oroya fever proper is caused by a parasite in the blood, which gives rise to severe infection, fever, rapid and very intense anemia, and great prostration, and often ends fatally. The parasite is found in the blood in fresh and stained preparations, often in large numbers. It is found in two typical forms: 1st, a rod-shaped bacillus, two micra in length, and one-fourth or one-eighth as thick. These rods are usually slightly curved. 2d, a small, rounded body, about one micron in diameter, lying with the red blood corpuscles. The organism has not yet been experimentally cultivated, and experiments on animals have not yet been followed by success. The organism is not a bacterium, but a true parasite of the red cells, of the type of *Protista*, allied probably to *Grahamella*. It has been named *Bartonio baciliformis*, and is probably the same as the organism described by Barton as the cause of Oroya fever and Peruvian wart. However, it is *not* the causative agent of the latter disease. The characteristic lesions of Oroya fever are found in the liver, spleen, and bone marrow. In the liver, there are areas of degeneration around the hepatic veins (central type). In these areas of necrosis there is a yellowish or brownish pigment which is neither melanin nor an iron compound. The spleen is enlarged, shows multiple infarcts and areas of necrosis in the pulp, but not in the spleenic nodules. The same type of pigment is found here as in the liver. The bone marrow shows proliferation, necrosis, and marked phagocytosis by the endothelial cells. The characteristics of Peruvian wart are the joint pains and the various types of eruption (miliary, nodular, and pustular). The causative agent has never been seen, and has not been cultivated. The fluid obtained from powdered material from the nodules can, by direct inoculation, produce intratesticular and intraperitoneal infection in dogs and rabbits. Monkeys have also been inoculated; the disease has

Digitized by Google

been kept alive in thirty-five monkeys. The monkey is not easily infected, and repeated cutaneous inoculation produces a kind of immunity. These experiments lead to the hope that in time a suitable vaccine will be made, capable of immunizing human beings.

Dr. Julian Arce, of Lima, who has been in close contact with these diseases all his life, approaches the subject more from its clinical side. In *La Clinica Medica* he deliberately says that his object was to lay down a clinical formula for the recognition of the grave form of Carrion's disease. He advocates the examination of the blood in all cases of intense febrile anemia, in addition to the clinical picture already set forth. He says, further, that the constant anatomical lesion, the *sine qua non,* of the grave disease, is found in the bone marrow, which is entirely converted into *red marrow.* The principal part of the disease takes place in the bone marrow, and not in the general circulation. Dr. Arce may well lay claim to priority over Prof. Strong in enunciating the separateness of the two diseases. In his medical thesis, presented in 1889, he says: "Before considering the diagnosis of the disease, I will make a few remarks concerning the opinion held by many physicians relative to Peruvian wart and Oroya fever. They believe that these two affections are but two stages of one and the same disease; that is, that Oroya fever is the period of invasion (incubation) of the eruptive wart. This view appears to me entirely erroneous. Indeed, the clinical histories of the cases studied clearly show that Oroya fever was Oroya fever from the very beginning." The same applies to Peruvian wart.

Thus, one by one, the dreaded diseases of the Tropics are being brought into the clear light of science and quickly shorn of their terrors. Prof. Strong's expedition to Peru illustrates anew the value of research expeditions into the habitats of the

Digitized by Google

terrors of the Tropics. We recall the elaborate yellow fever commission to Cuba by the National Board in 1879, after our fearful epidemic of yellow fever in 1878. That commission gathered a vast amount of useful information under the presidency of the late Dr. Stanford E. Chaillé. Dr. Geo. M. Sternberg, afterwards Surgeon-General of the U. S. Army, did some splendid microscopic work. His photomicrographs of the blood, which we were privileged to see, reflected great credit on the scientific side of the commission's work. But bacteriology was not yet born; and although Sternberg was a pioneer and an earnest worker in that branch, still, it was not until 1882 that Finlay determined that mosquitoes were the carriers of the infection. Since that time, scientific expeditions have been sent to Africa and many other countries. Koch's invaluable work is still fresh in mind. In New Orleans, we have made a good beginning. The Orleans Parish Medical Society, in 1905, sent an expedition to Mexico to investigate yellow fever. It is to be hoped that the path already marked out will be steadily followed, until all the diseases within the radius of influence of scientific study will have yielded up their secrets and been rendered powerless to scourge humanity. *A. McShane.*

The Health Officer's Obligation.—We have heard a great deal lately about the duty of the community to the public health. Much also has been said about the duty of the community to the health officer. Some of those which have been particularly emphasized are: 1. salary adequate for full time service; 2. tenure of office during good behavior and efficient service; 3. ample code and authority; 4. support by the courts; and 5. public coöperation. These are all just provisions and without them no appropriating body will receive one hundred cents worth of returns for each dollar expended.

Digitized by Google

But let us not forget that there are obligations on the part of the health officer. Not the least of these is proper preparation for his life's work.

Until quite recently qualifications of expertness have not been demanded of health officers, the only requisite being political loyalty to the party in power. But this is rapidly changing. Within the past few weeks a large Eastern city has widely advertised a civil service examination for a city health officer, open to the United States.

Preventive medicine has now attained a social, economic and scientific status worthy of the highest talent and the closest application. Trained sanitarians have been demanded and have been forthcoming for Cuba, Porto Rico, the Philippines and Panama, and our own municipalities are now clamoring for properly equipped health officers. Communities too small to afford full time health officers are now banding together in a system of coöperative health work with a trained sanitarian dividing his attention among them.

The M. D. degree alone does not equip the health officer, though it is an almost essential preliminary. Not every doctor is a qualified health officer, but every competent health officer should be a physician. Public health formerly dealt chiefly with the infectious diseases. This function is now only one of several equally important and it is necessary that the health officer be a *specialist* in public health. Such training can be obtained only by a special course. What school in its medical curriculum teaches anything of vital statistics, sanitary codes, budget making, report writing, etc.? The teaching in medical schools relates more to individuals and less to their environment. Health officers may become proficient through experience, but this experience often costs the public money, health and lives. Formerly the prospective physician read medicine for a few months under a preceptor and was then ready to hang out his

Digitized by Google

shingle. Now, after going through four years of strenuous curriculum, including clinical training, he is at least *safe*. So it should be with the health officer; he should be well equipped on first assuming a post.

In 1908 Irving Fisher complained: "We are still far, however, from having facilities for training public health officers or giving them such a degree as D. P. H. (diploma of public health) as is given in England."

This is not true to-day. There are now throughout the United States several schools offering courses of training in sanitary science. Here may be had the course leading to the degree of D. P. H. or a short practical course in the nature of post-graduate work. Some of the schools giving these courses have secured the coöperation of the city health departments, making field work possible. Dairy inspection is taught in the dairy, not in the lecture room; tuberculosis control is taught in the tuberculosis clinic and in company with the visiting nurse; medical inspection of schools is learned by practical experience. Methods of administrative procedure, including recording and reporting, are learned at headquarters.

It was suggested a few years ago that the state board of health be called upon to perform the same function for graduates in sanitation and pass upon their fitness to practice in the sanitary field as is now undertaken by the state board of medical examiners for graduates in medicine. This is probably an innovation of the near future. In fact, in some states this board now appoints at least the county health officers.

There exists already a demand for competent health officers. Practical training schools are now anxiously soliciting patronage. The responsibility for efficient and economic service is therefore directly upon the health officer.

Wm. H. Deaderick.

Digitized by Google

ORIGINAL ARTICLES

AN EPIDEMIC OF PARATYPHOID FEVER.*

(Origination from a Carrier and Dissemination by Vegetables.)

A. N. SINCLAIR, M. B., C. M.
Bacteriologist to the Territorial Board of Health, Honolulu.

An epidemic of paratyphoid, which occurred at Waiawa, on this island, last June and July, contained several points of a sufficiently interesting character, in my opinion, to form a subject for a paper, for presentation at this meeting.

Five cases of suspected typhoid were sent to the Queen's Hospital from Waiawa during the week June 9 to June 16, 1913.

On June 20 case No. 6 developed in another camp some two miles from the one in which the original case developed. This patient had never been in the originally infected camp, but had been in the habit of visiting a Japanese house near it. The relation of these camps is shown in the diagram.

A report and maps of the district were asked for and submitted to me.

Suspicion was at once aroused that the real focus was not Camp 1, but was probably the house N, as was indicated by No. 6 (occurring in Camp 2), who had never been in Camp 1, but who had been in the habit of visiting the house N.

The sanitary condition of the house N is thus described by the sanitary inspector in charge of the "cleaning up" decided upon by the Board of Health:

"Dwelling in a filthy condition; place infested with flies; ground surrounding house, filthy; privy-vault, which was a wooden bucket, placed in a hole in the ground, overflowing, alive with maggots, and exposed to the air. The owner was in the habit of taking this excreta and using it for fertilizer for garden products every ten days or so; the vegetables were dis-

*Read before the Annual Meeting of the Medical Society of Hawaii, November 22, 1913.

Digitized by Google

posed of to the various Japanese camps of the Waiahole Water Company."

While this description would lead to the suspicion that flies had to do with the dissemination of the germs of the disease, one important fact pointed to some other factor at work.

The Korean camp (A), almost as close to Camp 1, developed no case: if flies carried the infection, this camp would certainly not have escaped infection.

In N there were three men who gave no history of having had any illness resembling typhoid or paratyphoid, but who might be possible carriers for all that. It was decided to investigate this point and a specimen of feces was collected from each, under my directions, a culture made in broth immediately and forwarded to the laboratory.

Each was then placed in Endo's medium, and after an exhaustive search some colonies were found in the plates from one of them that grew with non-colon characteristics, and this was submitted to further tests.

On passing it through the sugars—dextrose, lactose and saccharose—it showed characteristics of being neither typhoid nor colon, producing gas on dextrose but none on saccharose or lactose.

It was a somewhat more energetic gas producer than even paratyphoid B in dextrose, whereas A is usually a meager gas producer.

On the other hand, it produced a very small amount of gas or color change (though both) on litmus-mannit—thus resembling paratyphoid A rather than paratyphoid B.

Again, on litmus milk it resembled both paratyphoid B and A. While paratyphoid B turns litmus-milk red and then back to blue in a few days, paratyphoid A turns it red permanently.

The bacillus isolated, and which I termed Bacillus X, turned litmus-milk red and then in a few days a blue ring of about half the length of the media in the tubes appeared at the top. The milk was not curdled, as is consistent with the typhoid-paratyphoid group.

It agreed with paratyphoid A and B (as excluding the colon group) in forming no indol in Dunham's peptone by addition of sulphuric acid and nitrite, or by dimethylaminobenzaldehyde.

Digitized by Google

These characteristics were confirmed by repeated tests as well as comparing them with controls of known cultures of colon—coli-communi, or paratyphoid A, paratyphoid B and typhoid—in order to insure the media's reliability.

Under the microscope the organism was extremely motile, and special staining showed delicate flagellæ—not so distinct or large as typhoid.

Agglutination tests were then resorted to.

On July 5 there were in the Queen's Hospital three cases ill for a period sufficiently long to be used for the purpose.

Serum was taken from each of these patients and tested with typhoid, paratyphoid A, paratyphoid B, and the recently isolated Bacillus X.

There was no, or very little, agglutination with typhoid or paratyphoid A.

With paratyphoid B. however, there was marked agglutination in 1 to 64 dilution of the serum in two hours. The same agglutination with Bacillus X.

But a peculiar circumstance, which I am unable to explain, was that while there was but little or no agglutination in higher dilutions with paratyphoid B in 24 hours, there was distinct agglutination in all three sera with Bacillus X up to 1 to 500 dilution.

Some serum was then obtained from the carrier and it gave the same agglutination tests as those of the patients in the Queen's Hospital.

Thus, while there were several points in the action of the Bacillus X in media more nearly resembling paratyphoid A than paratyphoid B, yet these sera agglutination tests practically ruled out its identity with paratyphoid A.

As there were discrepancies in the agglutination tests with B, it was decided that Bacillus X was of that class that is from time to time discovered intermediate between the typhoid and colon groups, which differ from each other in a few minor particulars.

It had been my intention to inoculate an animal with Bacillus X and, when immune, to carry on further investigation.

Digitized by Google

Other work, however, prevented my undertaking this till September, when the carrier came up to Honolulu for re-examination, as will be referred to later.

It occurred to me that as he was evidently immune to Bacillus X, it might save labor to carry out further agglutination tests with his serum instead of waiting for an artificial immune serum.

Saturation experiments were then made.

No diminution in agglutinating power of the serum for paratyphoid B or Bacillus X seemed to result from its previous action on an emulsion of typhoid or paratyphoid A.

On saturation with paratyphoid B, however, its agglutinating power on Bacillus X was lost, and conversely saturation with Bacillus X robbed it of agglutinating power for paratyphoid B.

Having received by this time some agglutinating sera for typhoid, paratyphoid A and paratyphoid B from the Cutter Laboratory, they were tried with Bacillus X.

Typhoid and paratyphoid A gave no agglutination with Bacillus X, although they would give agglutination at about 1 to 16 with the paratyphoid A culture, none with typhoid; paratyphoid B serum agglutinated Bacillus X, though not so easily as it did paratyphoid B.

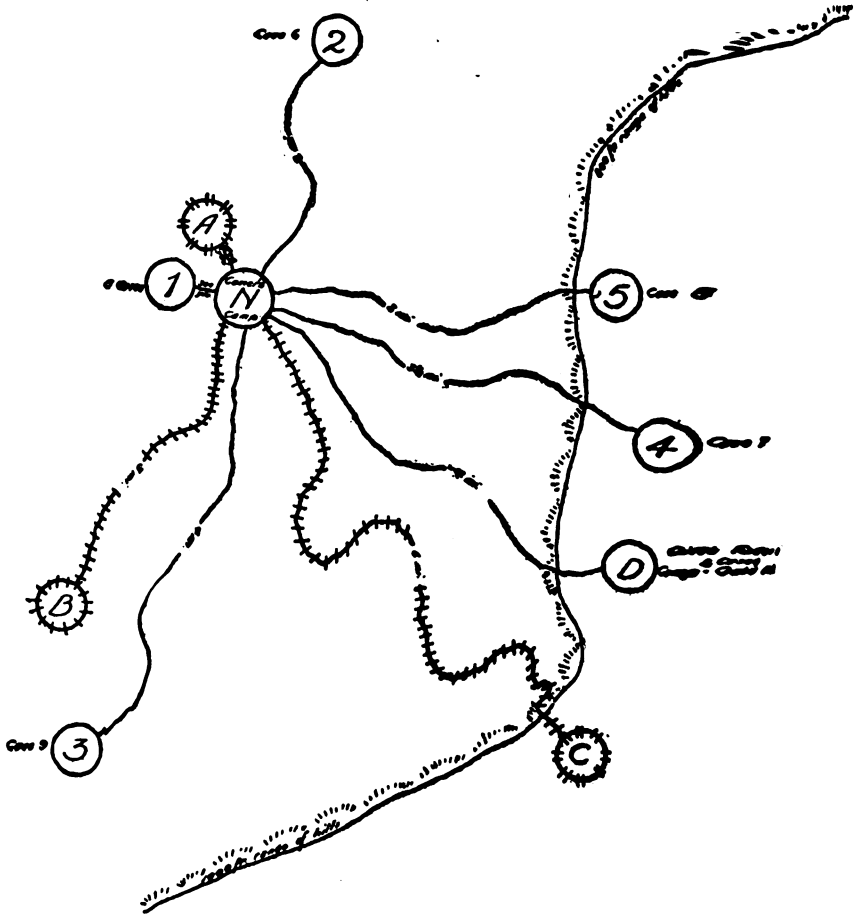
This paratyphoid B serum was then saturated with paratyphoid B and tried on Bacillus X; there was no agglutination, and it was finally found that Bacillus X could destroy by saturation its agglutinating power for paratyphoid B.

There is no question, therefore, that Bacillus X was actually paratyphoid B. The discrepancies in agglutination (that paratyphoid A serum agglutinated slightly paratyphoid B at 1 to 16, but not Bacillus X) being easily explicable by the fact that a culture grown in artificial media for some time (such as laboratory cultures) is much more susceptible to group or even to homologous agglutination than one recently isolated; to which fact also was due undoubtedly the discrepancies in agglutination in the beginning of the investigation.

Slight discrepancies of growth in media are frequently observed in members of this group, and are mainly valuable in indicating what agglutinating tests should be undertaken.

Digitized by Google

Diagram illustrating position of Camps in relation to the epidemic of Para-typhoid Fever at Waiawa Oahu June and July 1913.



Digitized by Google

Two specimens of sera were sent in from Waipahu in the middle of July for examination.

These specimens were found not to agglutinate typhoid or paratyphoid A, but they did agglutinate paratyphoid B, and a diagnosis of paratyphoid was made. As no connection was suspected by me of their association with the outbreak at Waiawa, they were not tested on Bacillus X.

This explanation is necessary as adding interest to the tracing of the agent of transmission of the infection, which we will now take up.

A chart of the locality is given to make the argument clear.

Distances are marked on the lines—hatched lines are used to show localities where no infection occurred; ordinary lines, localities to which infection was carried.

As already suggested, the infection was probably carried by vegetables, for if flies were responsible there would undoubtedly have been cases in the Korean Camp A, the men in which, on the other hand, had never visited house N, nor had any traffic with it.

Furthermore, the placing of excrement as fertilizer on the vegetables was stopped after the development of the first five cases in Camp 1.

It is probable that this fertilizing was responsible in great measure for these first cases—there were several during a short period of time—afterwards the cases were only sporadically developed, and were probably due to direct infection from the "carrier" himself, due to his handling the vegetables with infected hands—the first vegetables handled being the only ones infected, wiping off the bulk of infected material.

Case 6 probably got his infection at the house of Carrier N, although vegetables were sold by the carrier in this camp.

Case 7 occurred June 26 in Camp 4, three and a half miles from N, a range of hills 1000 feet intervening; fly infection is here out of the question. Vegetables were sold here, however, by the suspected carrier, although the disease may have been contracted in Camp 1, which the patient left less than a week prior to developing symptoms.

Case 8 (5) developed June 28. This, too, could have been

Digitized by Google

contracted in Camp 1, as the patient had only left it 12 days previously, and his wife was one of the first five cases. Again, however, it must be noted that vegetables were sold by the carrier in this camp.

Case 9 (3) developed July 16, and is worthy of note for several reasons.

First. He had not been in Camp 1 for 29 days prior to the development of symptoms.

Second. Vegetables were sold in this camp by the suspected carrier.

Third. This camp was four miles from the original focus, yet it developed a case, although a white camp, only three miles from original focus, and in the same general direction, developed no cases. As stated, vegetables were sold in this camp, not in the white Camp B.

Were it not for the long interval (29 days) from the patient's leaving Camp 1 to the development of symptoms, this and all the secondary cases might be considered as having picked up their infection in Camp 1.

But the fact of such a long interval occurring in this case proves the infection was not acquired in Camp 1—and if this case was not acquired there, it is also quite possible (the incubation of this disease being often less than a week, and not over 21 days) that all secondary cases were infected after leaving Camp 1 and by some foodstuff common to all infected camps. This argument is further borne out by the fact that all the men in Camp C had been in Camp 1 and no cases occurred there. It was on an almost inaccessible cliff and the carrier sold no vegetables there.

Therefore when it is considered that all the camps of the Waiahole Water Company, in which no vegetables were sold (though in some cases closer than infected camps and in the same line of direction) developed no cases, the indictment against the carrier and the vegetables he sold becomes extremely strong.

But when the further evidence is offered that in a camp belonging to another corporation (D), four miles away, none of whom had been in Camp 1, nor had any communication with the other camps, but who took vegetables from the suspected carrier,

Digitized by Google

and developed two cases of paratyphoid, a verdict of guilty against carrier and vegetables must be rendered.

No new cases developed after July 16. The carrier was brought to Honolulu, and detained at the Japanese Hospital for a week or more. He was given several courses of calomel treatment and returned to Waiawa with an injunction not to peddle vegetables, and ordered to report in a month for examination.

He reported in August and September, at which time the germ was again obtained from his stools, and each time he was given a course of calomel.

He reported again in October, when no colonies of a suspicious nature could be found.

These last remarks, however, are not to be interpreted as meaning that I believe the calomel treatment is able to free a carrier from infective bacilli or that I believe this one is now free from them, but these were the only legal steps possible, and as the camps are no longer being used, his danger to the community is small.

I may add that the carrier gave no history of any illness during the last two years resembling paratyphoid. The probability is, as with most carriers of typhoid, the infecting illness was very mild and passed practically without much illness.

Digitized by Google

FURTHER NOTE ON THE GROWTH OF FILARIAL EMBRYOS IN VITRO.

By FOSTER M. JOHNS, M. D.,
and
PERCY L. QUERENS.
(From the Laboratories of the School of Hygiene and Tropical Medicine, Tulane University, New Orleans, La.)

Introduction.

In a former note[1] one of us, Johns, in collaboration with Dr. Creighton Wellman, announced the "cultivation" of filarial embryos in vitro. In this article the term "cultivation" was based on a slight increase in length of the *Filaria immitis* in certain of the media employed. The statement was also made that this development was probably identical with the limit of development in the intestinal tract of the insect host, and that further modification of media to simulate the conditions maintaining in the malpighian tubules of the insect host would carry the filarial embryos to the final state of their development in the insect in which they are infective to the mammalian host.

Low[2] in a review of this note, after drawing attention to the evidently misleading title of the article, very correctly points out the previous observations on the behavior of this particular filarial embryo in the first few hours after the infective feed of the mosquito; in which the embryos immediately migrate to the malphigian tubules, and there the first increase in size is noted, and which is in breadth.

Bach[3] repeated the experiments outlined in the previous note with negative results. He also mentioned and agreed with the criticisms brought forward by Low.

That the development in the embryos in question was improperly termed a "cultivation," and compared to an erroneous idea of the development in the insect host, the present authors are quite willing to admit, both from the statements of the two authors quoted above, and after closely following the work of Mr. Willard V. King, of the U. S. Bureau of Entomology, who

Digitized by Google

has carried through quite a number of transmission experiments, and in which the statements as to the nondevelopment of the embryos in the intestinal tract were adequately borne out.

We cannot agree, however, with the observation of Bach as to the nondevelopment of the embryo in vitro. The experiments outlined in the previous note have been carefully repeated by the present authors; the same results being obtained in the case of embryos of *Filaria immitis,* and a greater development being obtained in a filarial embryo from an endemic infection of cattle in this vicinity which we believe to be the *Setaria labiato-papillosum,* although the adults have not been positively identified. It is for the purposes of correcting the mistakes made in the former note, and reporting exactly the development that we have been able to induce in these two species of filarial embryos, that this paper is here presented.

Methods Employed.

From 10 to 20 cubic centimeters of blood were drawn from the infected animals with a sterile all-glass syringe, the puncture being made directly into the heart of the dog, and the jugular vein in the cow. The blood was then run into sterile centrifuge defibrinating tubes either empty or containing enough of a 50% solution of Merck's dextrose to make a 0.5% of dextrose; or into tubes containing one-quarter volume of a solution of sodium citrate 1.5% in normal saline. In case of defibrination this was accomplished by means of stirring with a glass rod. The tubes were then centrifuged until the blood cells were completely thrown down. The leucocyte layer containing also the filarial embryos was then pipetted off with a capillary pipette having a very coarse lumen. The serum and cells remaining were then mixed up and placed in tubes having a diameter of 1 centimeter, in quantities that varied the column of blood from ½ to 5 centimeters in depth. These tubes were then centrifuged to form a compact layer of cells. Others were prepared, using in place of blood serum, normal salt solution, normal salt solution containing 1.5% sodium citrate, Locke's and Ringer's solutions; still others using serum, in addition to the above fluids, without the layer of blood cells. The inoculation of the tubes

Digitized by Google

with the concentrated suspension of filarial embryos and leucocytes was then made with a capillary pipette by seeding the surface of, or depositing it at the bottom of the cell layer, or merely dropping the suspension in such tubes as contained only fluid. The cotton plugs were then paraffined to prevent evaporation, and incubated at the varying temperatures of 12°, 28°, 37° and 40° C. Observations on both fresh and stained material were made every second day as long as motion could be detected in the embryos.

Observations.

Location in Culture.—In any of the cultures containing blood cells with supernatant fluids, all filarial embryos planted beneath the surface of the column of blood cells lost their motility, or motion in the case of the encapsulated setaria, coincident with the changes in the media causing the cells beneath the surface to assume a black appearance, and which took place in all undisturbed tubes on the third or fourth day. Methods of proper aeration of the cells in the lower layers of culture level being difficult of achievement the inoculations almost from the very first were made onto the surface of cells in such cultures. Direct contact with glass in the bottom of cultures containing no blood cells seemed to affect the embryos unfavorably; loss of motion and degeneration in three to seven days according to media employed. This could not be determined absolutely on account of the factors of nutrition and oxygen supply introduced by the presence of red cells in the cultures employing them. Cultures without red cells were also soon abandoned.

Depth of Culture.—In all of the media employing red cells with a column of supernatant fluid, the filaria being superimposed on the red cells, a depth of 1 centimeter for the supernatant fluid was by far the best. The depth of the column of cells beneath the surface seemed immaterial so long as the bottom of the tube was well covered.

Temperature.—In all cultures where special conditions were not induced to prevent death and degeneration of the red cells, the prolongation of life in the embryos was better at the lower temperatures. At 12° C. the filaria would exhibit motion on

Digitized by Google

warming the preparation up to 8 to 10 days. The embryos of *Filaria immitis* at this temperature in any of the cultures containing serum and cells would also show a development of an increase in length of from ⅓ to ½ their previous length. No increase in size of the embryos of *Setaria labiato-papillosum* was noted. With special protection of the red cells against death and dissolution, other conditions being equal, development and motion was more marked with the higher temperatures up to 40° C. For this same reason the optimum temperature is between 28° to 37° C. with media that we now have at command.

Media.—The filaria exhibited quicker growth, more motion and remained alive longer in those cultures in which the preservation of the red cells on the surface of the column of cells was the best. This is obtained by adding dextrose to 0.5% to the blood before defibrination, thus following the technic for preparation of blood for the cultivation of malarial parasites as brought out by Bass and Johns. In this medium at 37° C., the inoculation being made on the surface of the column of red cells, the embryos of *Filaria immitis* evinced motion and continued development for 17 days, while the *Setaria labiato-papillosum* continued to develop for 52 days. It may also be pertinent to mention here that the blood cells of cattle are much more resistant than either dog or human cells, which may account for the difference in time. In other media the vitality of the embryos is in direct ratio to the preservation of the cells and the nutriment afforded by the native serum. The least favorable medium being, of course, plain normal saline, in which motion was detected for 30 to 52 hours in both *Filaria immitis* and *Setaria labiato-papillosum* respectively.

Results.

In dextrose defibrinated blood from the dog, prepared and inoculated as previously outlined in detail, at a temperature of 37° C., the embryos of *Filaria immitis* exhibit growth and motility for a period of about fifteen days, when the media and organisms begin to disintegrate. The development is characterized by an increase in size of from 155.6x4.3 microns to 264.5x5.7 microns. Figs. I and II from preparations stained with Wright's

Digitized by Google

stain show generative changes within the organism that denote at least some development.

In similar cultures from the blood of cattle, at a temperature of 37° C., the embryos of *Setaria labiato-papillosum* exhibited growth and motility for a period of 52 days, when degenerative changes began to take place in both media and organisms. The development, Figs. III and IV, being characterized by an increase in size of from 135.5x10 microns, the beginning development of an appreciably visible alimentary tract, mouth parts, and terminal spicule, as well as other elementary structural changes that we are not in a position to interpret at present.

Bibliography.

1. Wellman, C., and Johns, F. M. The Artificial Culture of Filarial Embryos (A preliminary note). *Jour. Am. Med. Assn.*, Oct. 26, 1912, Vol. LIX, pp. 1531-1532.

2. Low, G. C. The Life of Filarial Embryos Outside of the Body. *Jour. Trop. Med. and Hyg.*, Nov. 15, 1912, Vol. XV, No. 22, pp. 338-339.

3. Bach, F. W. Ueber die "Mikrofilarienkulturen" von Wellman u. Johns, uebst Bemerkungen Ueber die Messung der Mikrofilarien. *Centralb. f. Bakt.* 1, Abt., Orig. 1913, July 29, Vol. 70, No. 1-2, pp. 50-60.

4. Bass, C. C., and Johns, F. M. The Cultivation of Malarial Plasmodia (*Plasmodium Vivax* and *Plasmodium Falciparum*) in vitro. *Exper. Med.*, October, 1912, pp.567-578.

Explanation of Plate.

Drawings made from specimens air-dried and stained with Wright's stain. Leitz ok. 4. obj. 1/12. Reichert camera lucida at angle of 45° and at level of table. Reduced one-half for reproduction.

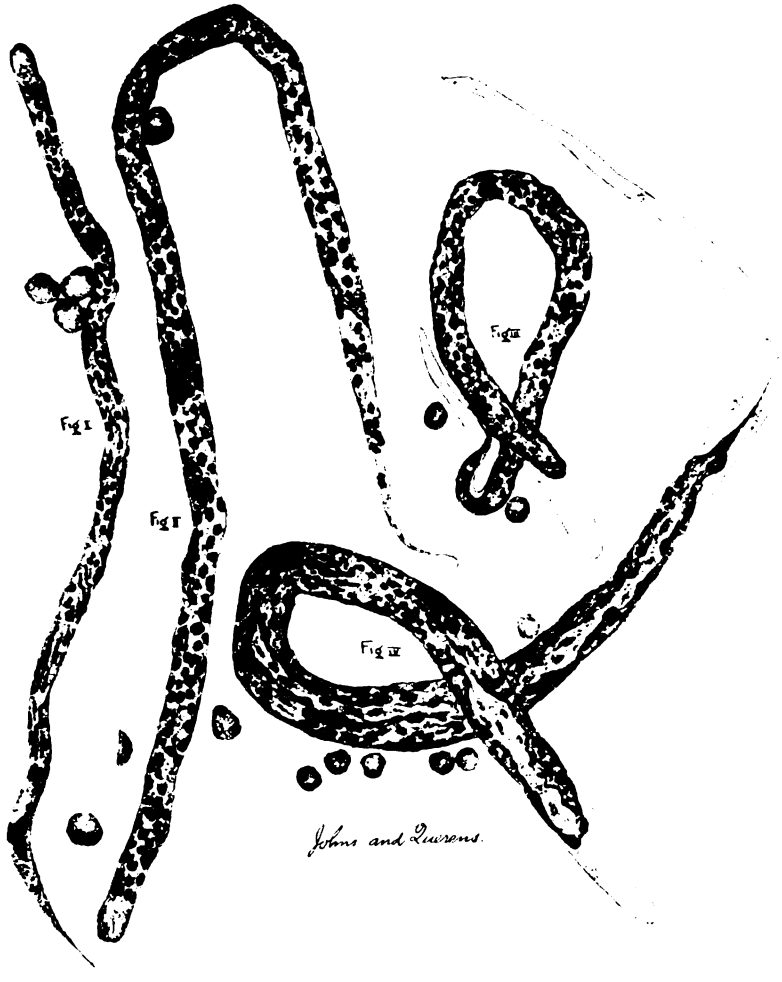
Fig. I. *Filaria immitis,* embryo from dog.

Fig. II. *Filaria immitis,* embryo in dextrose defibrinated blood at 37° C. for 15 days.

Fig. III. *Setaria labiato-papillosum,* embryo from cow.

Fig. IV. *Setaria labiato-papillosum,* embryo, in dextrose defibrinated blood at 37° C. for 52 days.

Digitized by Google



JOHNS AND QUERENS GROWTH OF FILARIAL EMBRYOS IN VITRO

Digitized by Google

Digitized by Google

INNOCUOUS BITES OF MALARIA AND YELLOW FEVER MOSQUITOES DURING THE DAYTIME.

EMILIO ECHEVERRIA, M. D.,
San José, Costa Rica.

It has for a long time been the experience of people living in malarial and yellow fever districts, that by avoiding nights in said places a decided immunity is conferred as long as such practice is regularly adhered to.

This was the customary use of Costa Rican natives who during colonial days cultivated on the Atlantic slope the prolific lands of Ujarras Valley; they were very much affected by malarial intoxication, until it was found that by stopping their daily toil at an early hour in the afternoon and spending evenings and nights in a higher locality, they were able to keep the cultivation of such rich soil and be free from a disease that rendered them unfit for work a good deal of their time.

The satisfaction of discovering this place was so great that the name of "El Paraiso" was given to it, "The Paradise" in English, by which name it is known to these days.

A similar experience is familiar to the dwellers of Rio Janeiro who have been in the habit of advising foreigners only to remain in the city during daytime and under no consideration to spend evenings there, but to go to the neighboring heights before night; as a result of this precaution non-immunes were protected against yellow fever contagium.

Now, those of us who have lived in the yellow fever zone cannot forget the voracity with which *Stegomyia calopus* has attacked us at all hours, even during the hotter part of the day, thus creating a most unpleasant feeling by their irritating stings.

How is it, then, that a non-immune person may be bitten with impunity by yellow fever carriers even in the height of a well-marked epidemic of the disease as long as this happens in the daytime?

The only practical explanation to this question and one that covers all points, is that the female mosquito comes to this

Digitized by Google

world with an inordinate appetite for a meal of blood that she will procure at her earliest opportunity and regardless of the time, provided that her wings are dry enough to carry her to the victim, and, of necessity, bites from mosquitoes that have never taken human blood into their systems are absolutely inert and sterile in so far as containing parasites growing and living in human blood.

As soon as this appetite is satisfied, the insect will become her real self and take to nocturnal habits which are natural to her, thus eating only during the night so as to be the well-known transmitter of yellow fever.

This being so, the prophylaxis of these diseases should be comprised in the few words, "avoid being bitten by a night mosquito."

Digitized by Google

THE HEALTH SURVEY.

WILLIAM H. DEADERICK, M. D.,
Hot Springs, Arkansas.

The most significant evidence of the results of the modern municipal efficiency movement is the widespread consideration of health matters. Much attention formerly devoted to the accounting department, contracts and pursuit of graft is now centered on public health and health departments are deservedly coming in for their share of investigation with a view to improvement through constructive criticism. Cities formerly advertising low tax rates, good railroad facilities and other trade inducing advantages are now turning to low death and morbidity rates, child welfare, and other health functions as commercial assets.

The world-wide public health movement recently initiated will gather increasing momentum with public enlightenment on health subjects. One of the most serious impediments to sanitary progress is popular ignorance of sanitary principles. Publicity is the remedy. The survey is the gateway to publicity. The health department should be surveyed at intervals just as the individual goes to the dentist periodically to have his teeth examined or as the merchant takes stock. A correct diagnosis of defects in the sanitary system is essential to proper conservation and development of the city's health resources.

In the search for sanitary defects a definite program is a vital essential. The following scheme may prove useful where it is not desired to import an "expert" to make the survey.

GENERAL DATA.

City..... County..... State..... Altitude..... Topography.....
Water Courses..... Natural drainage..... Area of city.....
Population 1900....., 1910....., Present.....
Density of population by wards.....
Present population by ages.....; by race or nativity.....

ORGANIZATION OF HEALTH DEPARTMENT.

Board of Health—
Number

Digitized by Google

Qualifications
Appointment
Salary
Term
Reports and Records

Powers and Duties—
Legislative
Administrative
Charter
Statutory
Ordinance

Employees—
List
Duties
Appointment: civil service
Salary
Term
Time given and hours
Records and Reports

Personnel Controlling—
Contagious Diseases
Tuberculosis
Sanitary inspection
Streets and garbage
Food inspection
Water supply
Sewerage
Housing conditions
Child welfare
Medical school inspection
Hospitals
Laboratories
Vital statistics
Health education

Revenues—
Appropriation
Licenses and permits
Fines

Expenditures—
Get copies of code, reports, minutes, blank forms and map of city.

Chart Health Department—
Institution of new measures under present administration.....
Defects acknowledged by department of health.....
Purchase and control of supplies.....
Is health office a model of sanitation?.....

Digitized by Google

Coöperation with civic organizations.....With other city departments.....

Are time records required of all employees?.....

Permits issued, fees obtained and disposition of fees.....

How frequently does board of health meet?.....

CONTAGIOUS AND COMMUNICABLE DISEASES.

Under whose supervision.....Any special inspectors.....

What diseases reportable.....Efforts to insure reporting.....

What diseases quarantined.....Method.....

Inspection of quarantined cases.....Quarantine of family.....

Of those living in adjacent apartments.....Duration of quarantine for the various diseases.....Cases placarded.....

Quarantine of those exposed.....

Efforts to trace source of infection.....Are schools notified?.....

Are libraries notified?.....Diseases excluding from schools.....

Duration of exclusion for various diseases.....

What necessary for readmission.....Is throat culture made in diphtheria?.....

After what diseases is fumigation done?.....Method: By whom.....

At whose expense.....Fumigation of school and library books.....

Disinfection after removal or death from tuberculosis.....

Supervision of contagious diseases of animals.....

Furnishing of antitoxins.....Of culture media.....

Are druggists required to report sales of antitoxins?.....

Measures against flies, mosquitoes and rats.....

Hospital facilities for contagious diseases.....Pesthouse for smallpox.....

Are contagious diseases recorded by wards?.....Are maps and charts made?.....

Are contagious diseases charged to milk dealers' records?.....

Are industrial diseases investigated?.....

How does the department notify physicians of the increase of contagious diseases?.....

Regulation of prostitutes.....Supervision of venereal diseases.....

Check Against Contagious Disease Record—

Records of deaths from contagious diseases.....Records of bacteriological laboratory.....Records of hospitals and dispensaries.....

Compare: Number of deaths from contagious diseases with number of cases reported and this with usual mortality elsewhere.....

City's present morbidity with that for past few years.....Morbidity with that of other cities.....

Number of cases reported with number of fumigations recorded.....

Digitized by Google

TUBERCULOSIS.

For the City—

Amount spent by the city on tuberculous service.....

Anti-tuberculosis societies: Number.....Activity.....Duplication of function.....Money expended.....Results.....

Coöperation: Relief through public and private charities.....Relief through loan agencies.....Distribution of food.....

Is tuberculosis reportable?.....What forms?.....Efforts to secure proper reporting.....Are suspicious cases reported?..... Is removal reportable?.....Are cases systematically inspected?.....

Disinfection after removal or death.....Tuberculosis clinics.....

Drugs furnished.....

City or county sanatorium.....Private sanatoria.....Access to state institutions for tuberculosis.....Laboratory facilities.....

Frequency of re-examinations.....Visiting nurse staff.....Distribution of printed instructions.....

Is every case under supervision of private physician, sanatorium, clinic or nurse?.....

Care of indigent cases unable to leave homes.....

Has city power to remove certain cases to hospital?.....

Is there a proper building code?.....Enforcement..... .....Arrests.....Penalties.....Enforcement of anti-spitting ordinances..... Arrests..... Penalties..... Anti-spitting signs.....

Common drinking cups.....Towels.....

Are tenements systematically inspected?.....Factories and shops.....

Milk inspection.....Meat inspection.....

Medical school inspection.....Examination of factory employees.....

Coöperation with street cleaning department.....

Open air classes.....Tent colonies or camps.....Piers, boats and day camps.....

Class treatment.....Publicity.....Reports to whom?.....

How often publication.....Method of keeping records.....Completeness and accuracy.....Record of cases as to locality and house.....

Check against tuberculosis register: Record of deaths from tuberculosis.....Records of clinics and hospitals.....Records of laboratories.....

Compare: Number of cases reported with number of deaths recorded.....

Mortality per 10,000 population with that of other cities.....

Per cent. deaths from tuberculosis of total mortality with that of other cities and registration area.....

City's present death rate with that of past few years.....

Digitized by Google

Number of cases reported with number of fumigations.....Number of deaths reported with number of fumigations.....

For the Hospital—

Location.....How supported.....Construction, pavilions, cottages, solaria, etc.....

Cost of construction.....Cost of maintenance.....

Number of accommodations.....Stage of cases admitted.....

Medical staff.....Appointment.....Salary.....Time given.....

Nursing staff.....Appointment.....Salary.....Time given.....

Is hospital a model of sanitation?.....Present census.....

Enforcement of outdoor sleeping.....Rest regulations.....

Clothing regulations.....Hours of sleep.....Diet.....

Instruction of patients.....Treatment.....Progress of patients.....Reports to whom.....How often.....Publication.....Records how kept.....Completeness and accuracy.....Mortality.....Causes of discharge.....

For the Clinic—

Location.....Neighborhood.....How supported.....Medical staff..... Appointment..... Salary..... Term..... Time given.....Time sheets.....

Nurses.....Appointment.....Salary Time given..... Time sheets.....

Are they under supervision of the physicians?.....

Clinic hours.....Sundays.....Form and stages of disease treated.....

By whom are cases referred to clinic?.....Other sources from which cases are obtained.....

Do local physicians coöperate?..... ....Does nurse visit cases in homes?.....Number of visits.....Frequency per case..... Amount of nurse's time devoted to clinic.....To visits.....

Equipment of clinic.....Placards.....Sputum cups..... Sanitary drinking cups.....Handkerchiefs.....Waste receptacles.....Screens.....Drugs furnished.....Food and other aid.....

Is clinic a model of sanitation?.....Diagnostic methods..... Laboratory facilities.....How often does each patient report?.....Frequency of re-examinations.....Number of cases treated.....Number of cases examined.....Number of cases not tuberculosis.....

Average duration of treatment.....Number of cases referred to hospital.....Who does clerical work?.....Method of keeping records.....

Examine records to ascertain: completeness of history, weight and temperature records, number of visits to clinic, frequency of re-examination, number treated and number quitting before discharge

Digitized by Google

or death, reporting of cases to proper authority, financial accounting.

Visit cases to ascertain efficiency of nursing service.....

Get copies of all blank forms.....Draw diagram of clinic.....

Score according to ventilation, lighting, heating, cleanliness, etc.....

Nose and throat clinics.....Dental clinics.....

For the Open Air School—

Description of premises.....Equipment school and individual.....

Screens.....Accommodations.....Enrollment.....

Physical examinations.....Bathing.....Exercise.....Food.....

Rest.....Instruction.....Physical results.....Records.....

Tabulate to show original condition and improvement.

SANITARY INSPECTIONS.

For the City—

Under whose supervision.....Number of inspectors.....Appointment.....Salary.....Term.....Time given.....

Work and time records.....Reinspections.....Checks on efficiency.....

Reports to whom.....How often.....

Are systematic house-to-house inspections made for detection of unsanitary conditions in dwellings?.....In tenements.....

Hotels.....Lodging houses.....Municipal buildings.....

Barber shops.....Laundries.....Moving picture theaters.....

Factories.....Workshops.....Livery stables.....

Parks.....Public comfort stations.....Railroad terminals.....

Boats.....Privies and cess-pools.....

Are fees charged institutions inspected?.....

Other duties of inspectors.....Violations of sanitary ordinances..... Arrests..... Prosecutions..... Convictions.....Penalties.....

Can inspectors make arrests for violations of sanitary code?.....

Smoke regulations and efforts to enforce.....Violations.....

Penalties.....

Plumbing inspection.....Public drinking cups.....Common towels.....Noise prevention.....Keeping of animals on premises.....Clean-up days.....Mosquito prevention.....

Complaints, disposition when received verbally.....Written.....

How recorded.....Neatness.....Completeness of data.....

Accuracy of arrangement.....How referred to inspectors.....

How reported by them.....Final disposition.....Are complaints classified according to wards or locality?.....Any maps showing locality.....

Tabulate by months: total number complaints; number inspected by each inspector; number cases in which inspectors were complain-

Digitized by Google

ants; number arrests, convictions, fines; causes of complaints; districts or wards.

For the Hotel or Lodging House—

Name.....Location.....Neighborhood.....Kind of building.....Number of stories.....Occupants of first floor.....
Condition of basement.....Condition of rear premises.....
Fire escapes.....Direction doors open.....Width of stairs.....Stairs fireproof.....Width of corridors.....
Lighting and ventilation of corridors.....Fire plugs, hose, pails, or chemical extinguishers.....Heating.....Lighting.....Ventilation.....Water supply.....Sewerage.....
Number and condition of water closets.....Outside light and ventilation.....Number and condition of bathrooms.....
Drinking cups.....Common towels.....
Number of rooms.....Size.....Cleanliness.....Lighting.....Ventilation.....Number beds.....Condition.....
Removal of garbage.....
(See schedule of restaurants, food inspection.)

For the Factory or Workshop—

Name.....Location.....Character of work performed.....
Kind of building.....Number stories.....Condition of premises.....Fire escapes.....Number and kind of employees.....
Exposure to occupational diseases and accidents.....
Hours of employment.....Medical inspection of employees.....
Fire plugs, hose, pails and chemical extinguishers.....
Direction doors open.....Width of stairs.....Stairs fireproof.....
Heating.....Lighting.....Ventilation.....Cubic air space.....
Water supply.....Sewerage.....Condition of floors, fixtures, and walls.....
Number and condition of water closets.....Outside lighting and ventilation of water closets.....
Facilities for personal cleanliness.....Common towels.....
Drinking cups.....Sweeping and cleaning..... (Draw diagram.)

For the Barber Shop—

Name.....Location.....Number of chairs.....Lighting.....Ventilation.....Water supply, hot and cold.....
Sewerage.....Water closets.....Heating.....Floor covering.....Hangings.....Cleanliness of floor.....Of walls and ceilings.....Of chairs.....Of lavatories.....
Of other fixtures.....Brushes and combs.....Scissors, clippers and razors.....Mugs and shaving brushes.....Covering for head rest.....Use of sponges.....Clean towel for

Digitized by Google

each person.....Lump alum and styptic pencils.....Powder puffs.....Massage appliances.

Cleanliness of barbers: Washing of hands for each customer..... Sterilization of implements. (Diagram.)

For Livery Stable—

Name.....Location of building.....Neighborhood.....Kind of floor.....Number of animals.....Heating.....Lighting.....Ventilation.....Water supply.....Sewerage.....Condition of water closets.....Condition of stalls.....Food racks.....Bedding.....Urine gutter.....Odors.....Flies and vermin.....Protection of manure.....Frequency of removal.....Disposition..... Drainage from vehicle washing.....Accommodations for sick animals..... (Diagram.)

For Moving Picture Theater—

Name.....Location.....Kind of building.....What floor.....Seating capacity.....Fire escapes..... Stairs.....Fire plugs.....Exits, number.....How marked.....Regular or emergency.....Any permanently closed doors which might be mistaken for exits.....Direction doors open.....Fire buckets.....Fire extinguishers..... Proximity of adjacent buildings.....Heating.....Water closets.....Lighting.....Location of lantern.....Protection of lantern.....Ventilation.....Floor covering..... Curtains and hangings.....Drinking facilities.....Cleanliness.....Attendance of children without guardians.....

STREET CLEANING.

Total mileage paved streets.....Mileage each kind.....

Mileage unpaved.....Are water, gas and sewer pipes laid before paving?.....

Who decides kind of paving to be laid on given block?.....

Width of streets.....Trees.....Car tracks.....Sprinkling.....

Methods of sweeping.....When done.....How often.....

Flushing.....Disposition of street refuse.....Household garbage removed by city or privately.....

Disposition.....Ashes.....How often each season?.....

Garbage cans furnished by whom?.....Sufficient number.....

Construction of ash receptacles..... Separation of ashes and garbage.....Removal in cans or carts.....Carts open or closed.....Cleaning of carts.....Cost per annum of removal.....Reduction plants or destructors.....Private destructors in hotels and factories.....Public paper and rubbish receptacles.....Dead animals removed by city or by con-

Digitized by Google

tract.....Cost.....Disposition of dead animals.....
Sale of hides.....
Number of swill collectors.....Regulations and license.....
Efficiency.....Sweeping of sidewalks by business houses, when permitted.....Sidewalk gratings.....Published reports.....

FOOD INSPECTION.

Milk Inspection.

For the City—

Under whose supervision.....Number of inspectors.....
Appointment.....Salary.....Term.....Time given.....
State and federal inspection of milk consumed locally. .....
Are dairies licensed?.....By whom?.....Number.....Fees.....
Are creameries licensed?.....By whom?.....Number.....Fees.....
Are milk stores licensed?.....By whom?.....Number.....Fees.....
Source of city's milk.....Length of time in transit.....
Requirements of pasteurization.....Bacterial contents raw.....
Bacterial contents pasteurized.....Cooling temperatures.....
Is milk graded?.....Are dairies regularly inspected?.....
How often?.....Are herds tuberculin tested?.....
Disposition of affected cattle.....Are creameries and milk stores regularly inspected?.....How often?.....
Is milk tested in city laboratory?.....How often?.....
Are all scores regularly published?.....
Physical examination of dairy and creamery employees.....
Violations of milk regulations.....Arrests.....Convictions.....
Fines.....Exclusions from market.....Ice cream and butter regulations.....
Compare dairy scores with previous scores to ascertain improvement.

For the Dairy—

Owner.....Location.....How often inspected.....
Quantity of milk produced.....To whom sold.....Distance.....
Length of time in transit.....Care during transit.....
Number of cows.....Are all persons employed free from infectious disease?.....Water supply.....Analysis.....
Tuberculin testing of herd.....Location of stable.....Construction.....Size.....Proximity to privies, hog pens, manure pits.....Condition of floor, walls and ceiling.....Odors.....
Lighting.....Ventilation.....Drainage.....
Condition of cowyard.....Accommodation for sick cows.....
Removal and disposition of manure..... ....Location of privy.....
Cleanliness of passageways, stalls and bedding.....
Of cows: Long hairs on belly.....Condition of udders.....
Cleanliness of milkers' clothing.....Hands.....Cleanliness of utensils.....Sterilization.....

Digitized by Google

Buckets with narrow or broad openings.....Seams.....
Cleanliness of milk house.....Proximity to stable.....
Refrigerating facilities.....Prompt cooling.....Keeping at low temperature.....Pasteurization.....Screens.....

For the Creamery—

Name.....Location.....Surroundings.....Size of building.....
Construction.....Screens.....Source of milk supply.....
Inspection of dairies supplying milk.....Time from milking to receipt.....Care during each stage of shipment.....Quantity handled.....Bottles.....Cans.....Heating.....
Lighting.....Ventilation.....Water supply.....Sewerage.....Condition, ventilation and lighting of W. C.....
Facilities for personal cleanliness.....Cleanliness of employees.....
Laboratory.....Refrigerating facilities.....
Cleanliness and condition of floors, walls, ledges and ceiling.....
Protection of milk from flies and dust.....
Crate and bottle sterilizer.....Bottling and capping machine.....
Pasteurizer.....Cooling tank.....Cleaning of tubing.....
Separators.....Pasteurization continuous or held.....
Time and temperature.....Recording apparatus.....
Automatic thermo-regulator.....Care of cans.....
Location of stables.....Connection with creamery.....Cleanliness.....Removal and disposition of manure.....Condition of wagons.....

For the Milk Store—

Name.....Location.....Class of other goods sold.....
Quantity of milk sold.....Bottled.....Loose.....
Source of milk supply.....Time from milking to receipt.....
Size of store..... Ventilation..... Lighting..... Water supply.....
Sewerage.....Screens.....Condition of water closet.....
Outside light and ventilation of water closet.....
Facilities for personal cleanliness.....Cleanliness of floors, walls, ledges, ceilings.....Of fixtures.....Of employees.....
Presence of flies.....Odors.....
Adjacent sleeping apartments.....Stable.....
Milk delivered inside or left on sidewalk.....
Protection of milk in store.....Refrigeration.....Other articles in refrigerator.....Condition of ice box.....
Seamless dippers.....Cleanliness of dippers and utensils.....
Loose milk dispensed automatically or by hand.....
(Diagram showing W. C., etc.)

Digitized by Google

MEAT INSPECTION.

For the City—

Under whose supervision.....Number of inspectors.....Appointment.....Salary.....Term.....Time given.....
State and federal inspection of meat consumed locally.....
Number abattoirs under supervision of health department.....
Number meat markets.....Antemortem inspection of cattle.....
Is there systematic inspection of butcher shops?.....Of packing houses.....Vessels.....Markets.....Railroad depots.....
Stockyards.....Slaughter houses.....Commission houses.....
Fat houses.....Licensed peddlers.....Cold storage plants.....
Are these licensed?.....Number of each.....Violations.....
Convictions.....Fines.....
Amount condemned.....Disposition of condemned meat.....
Microscopic examination of pork.....

For the Abattoir—

Name.....Location.....Neighborhood.....Number animals killed.....
Frequency of inspections.....Federal and state inspection.....
Character of building.....Water supply.....Sewerage.....
Ventilation.....Light.....Construction of floors.....
Screens.....Cleanliness of floors, walls and ceiling.....
Of fixtures.....Of utensils and tools.....Of employees.....
Medical inspection of employees.....Condition of water closet.....
Outside lighting and ventilation of water closet.....
Facilities for cleanliness.....Cuspidors.....Flies.....
Sanitary condition of yards, pens, alleys and chutes.....
Is refuse fed to animals?.....Accumulations of filth.....
Disposition of manure.....Odors.....Disposition of hides.....
Of blood.....Of offal.....Any fat rendering.....
Refrigerating facilities.....Suspicion of preservatives.....
Complaints of neighbors.....

For the Meat Market—

Name.....Location.....Other goods sold.....Frequency of inspection.....
Ventilation.....Heating.....Lighting.....Water supply.....
Location of water closet.....Condition.....
Outside lighting.....Lighting and ventilation of W. C.....
Cleanliness of floors, walls, ledges and ceiling.....of fixtures.....
Of utensils.....Of meat racks.....
Meat exposed outside.....Carcasses in hides.....Odors.....
Adjacent sleeping apartments.....Receptacles for scraps.....
Disposition of scraps and garbage.....Facilities for cleanliness.....
Cleanliness of refrigerator.....Drainage.....

Digitized by Google

Poultry properly plucked.....Evidences of plucking on premises.....

Cleanliness of employees..... (Diagram.)

For the Bakery—

Location in building and address.....Basement.....

Size.....Class of products.....

Condition of floor, walls, ledges and ceiling.....Of fixtures.....

Of proof boxes.....Of utensils and implements.....

Vermin-proof bins.....Heating.....Lighting.....Ventilation.....Water supply.....Sewerage.....Water closets.....Outside ventilation and lighting of water closet.....

Screens.....

Flies.....Dough mixed by hand or machinery.....Facilities for cleanliness.....Cleanliness of employees.....Apparent health.....

Exposure of supplies.....Of products.....Storage of products.....

Evidence of rats and vermin.....Adjacent sleeping quarters.....

Sweeping.....Presence of animals..... (Diagram.)

For the Restaurant—

Name.....Location.....What floor of building.....Size of dining room.....

Light.....Ventilation.....Heat.....Water supply.....

Floor and covering.....Walls and ceiling.....Hangings.....

Linen.....Dishes.....Silverware.....Cleanliness of waiters.....Size of kitchen.....Light.....Ventilation.....Sewerage.....Facilities for cleaning utensils.....

For personal cleanliness.....Condition of kitchen utensils.....

Fixtures.....Floor.....Walls.....Ceiling.....Evidences of rats and vermin.....Cleanliness of kitchen force.....

Storage of supplies.....Refrigerating facilities.....

Exposure of food.....Disposal of garbage.....Water closets.....

(Diagram.)

For Food Products Factories—

Name.....Products.....Number employees.....Kind of building.....Condition.....Water supply.....Lighting.....Ventilation.....Heat.....Sewerage.....

Screens.....Fire escapes.....Water closets, number and condition.....Outside light and ventilation.....

Facilities for personal cleanliness.....Sweeping and scrubbing.....

Medical inspection of employees.....Apparent health.....

Observe process of manufacture and note contact of hands at various points.....Cleanliness of floors, walls, ledges and ceiling.....

Of fixtures.....Utensils.....Tools.....Employees.....

Digitized by Google

Evidences of rats and vermin.....Exposure of supplies.....
Products.....
Disposition of refuse and by-products.....

For Ice Factory—

Location.....Health of employees.....Medical inspection of employees.....Light.....Ventilation.....
Water supply.....Analysis.....Natural ice.....Analysis.....
Sewerage.....Water closets.....Cold storage.....
Products stored.....
Facilities for personal cleanliness.....Cleanliness of employees.....
Cleanliness of premises.....

For Bottling Works—

Location.....Surroundings.....Heat.....Light.....
Ventilation.....Sewerage.....Water closets.....water supply.....
Facilities for cleanliness.....Cleanliness of employees.....Of fixtures.....Machinery.....Utensils.....Lead in stopper and carbonating pipes.....
Purity of syrups, sugar, flavors and other ingredients.....
Protection of supplies.....Cleaning of bottles.....Are bottles shotted?.....Are clearing house bottles used?.....
Are empty bottles protected and stored neck down?.....
Cleanliness of crates.....Are piping, plungers, etc., clean?.....
Manufacture of syrups.....Coloring matters and preservatives.....

WATER SUPPLY.

Source.....Sanitary control exercised by health department.....
How brought to city.....Capacity of conduits or pumps.....
Cottages, dry closets, railroad tracks, etc., along water shed.....
Methods of purification.....Of storage.....
Number and capacity of reservoirs.....Policing necessary.....
Enclosure and protection.....Average daily consumption.....
Per capita consumption.....Meter or flat rate.....
Public drinking places.....Cups.....Physical characteristics of water.....Consumption of cistern and well water.....
Depth and character of wells.....Relation of cistern and well water to sickness.....Chemical and bacteriological analyses at supply head.....At pumping station.....At faucet.....
Number fire hydrants.....Public baths.....

SEWERAGE.

Natural drainage.....Mileage of sewers.....
System separate for surface water or combined.....
Number of outfalls.....Where discharged.....Flush tanks.....
Proportion of city sewered and unsewered.....

Digitized by Google

Number of house connections.....Sewers ventilated.....
Is sewer connection compulsory when street is sewered?.....
Cesspools allowed.....Privies.....Construction.....
Part of city.....Number.....How supervised.....Systematic inspection.....
Provisions for removal of night soil.....Odors from street openings.....Purification works.....Plumbing inspection.....

HOUSING CONDITIONS.

For the City—

Has the city a building code?.....
What sanitary control exercised by health department?.....
Are public buildings systematically inspected?.....Dwellings.....
Tenements.....Lodging houses.....Hotels.....Workshops.....How often?.....
Violations of building code.....Of sanitary ordinances.....
Arrests.....Convictions.....Penalties.....Records of inspections and violations.....
Does health department keep for benefit of citizens a list of dangerous premises?.....

For the Tenement—

Location.....Size of lot.....Of building.....Number stories.....Number apartments.....Number families.....
Construction.....Date of erection.....Condition.....
Fire escapes.....Stairs fireproof.....Direction outside doors open.....Halls, width.....Lighting.....Artificial light necessary.....Cleanliness.....
Rooms, size.....Number windows.....Window glass area.....
Artificial light.....Number persons each bedroom.....Ventilating system.....Odors.....Heating system.....
Water supply.....Water closet facilities.....Condition.....Bathing facilities.....Condition of plumbing.....
Privies or cesspools.....Garbage removal.....Provision for drying clothes.....Cellar construction.....Damp or dry.....
Light.....Ventilation.....Water closets in cellar.....
Condition of yard.....Paved.....Animals on premises.....
Business carried on.....Rents.....Complaints of tenants.....

CHILD WELFARE.

For the City—

Under whose supervision.....Amount spent on service.....
Prenatal instruction.....Number milk stations.....Season open.....Hours.....
Medical staff.....Time given.....Time records.....
Nursing staff.....Time given.....Time records.....Reports

Digitized by Google

to whom.....How often?.....Efforts made to locate cases.....

Source of milk supply.....Pasteurization.....Modification.....
Standard or individual formulæ.....Quantity dispensed.....
Sold by department or as a concession.....Price.....
Amount given away.....Bottled or loose.....Distribution of ice.....Disposition of unsold milk.....

Instruction to mothers.....Individual or in classes.....Average attendance.....

Frequency of nurses' visits to homes.....Character of instruction.....

Lectures to mothers.....Little Mothers' Leagues.....

Method of keeping records.....Charts and diagrams.....

Progress of cases.....Diet prescribed.....Treatment given.....

Thoroughness of examination.....

Frequency of patients' visits to clinic.....

Frequency of nurses' visits to patients.....Doctors' visits.....

Visit cases to ascertain efficiency of nurses.....

Coöperation with other organizations.....

Piers.....Boats.....Country outings.....

How are midwives licensed?.....Number in city.....

Proportion of cases they attend.....Instruction by department.....

Inspection of premises, equipment and records.....

Are they required to report complications in mother and child?.....
How soon required to report still-births?.....

Investigation of still-births and complications occurring in their practices.....

Are still-births and complications charged to midwife's record?.....

Regulations governing care of eyes.....Proportion of cases of ophthalmia neonatorum.....

Compare midwives reporting births with list of registered midwives.....

Regulation and supervision of foundling asylums.....

Regulation and supervision of boarding out of infants.....

Regulation and supervision of day nurseries.....

Regulation of employment certificates.....

MEDICAL INSPECTION OF SCHOOLS.

For the City—

Number public schools.....Enrollment.....

Number private and parochial schools.....Enrollment.....

Per capita cost of medical inspection.....

Is birth record essential to entering school?.....

Is evidence of vaccination?.....

Lectures on hygiene at schools: Sex hygiene.....Social centers.....
Open air classes.....

Digitized by Google

Physical examination of teachers required.....Pension of teachers.....

Number medical inspectors.....Appointment.....Salary..... Term.....Time given.....

Do they register time of arrival and departure?.....

What reports do they make?.....To whom?.....How often?..... Are reports published?.....

Are inspectors required to make systematic inspection of school premises?.....How often?.....

Do all children of public, private and parochial schools receive physical examination?.....How often?.....

Total number of enrollment examined.....Total number defects.....Classify.....

Total number recommended for treatment.....Total number receiving treatment.....Classify.....

Are re-examinations made after treatment claimed?.....

Are pupils seated with reference to defects of sight and hearing?..... Are teachers notified as to defects found?.....Are parents?..... How are subsequent notices sent?.....

Are consultations held with parents?.....

Number visits made by doctors to homes.....Are they required to visit all absentees?.....

Who inspects for contagious eye and skin diseases?.....How often?.....Method.....

Do inspectors visit classrooms or see only cases that are referred to them?.....What cases so referred (apparently sick, recent absentees, etc.)?.....

Number exclusions on account of contagious diseases.....

Number days lost.....How is duration of exclusion determined?.....

Are contagious diseases reported to proper authority?.....

Requirements for readmission after contagious disease.....

Are books fumigated?.....What cases of tuberculosis excluded?.....

Do inspectors treat cases?.....

Number of nurses.....Appointment.....Salary.....Term..... Time given.....

Do they register time of arrival and departure?.....

Do they make classroom inspections?.....Do they treat cases?.....

Do they follow up defects until dismissed?.....Do they make home visits?.....To what class of cases?.....

What reports do they make?.....To whom?.....How often?.....

Are reports published?.....Are inspectors and nurses under same supervision?.....Do they coöperate?.....

Is complete record of examination, defects and treatment kept on one card?.....Does teacher keep such a record?.....

Digitized by Google

Do school authorities coöperate to secure proper treatment of defects?.....What facilities for treatment: Of defective vision.....Defective hearing.....Enlarged tonsils..... Adenoids.....Defective teeth.....

School clinics.....Class of cases treated.....Are inspectors, nurses and teachers notified when treatment is completed?.....

Are there sanitary drinking founts in all schools?.....

Common towels.....Are physical examinations required for athletics?.....

School lunches.....Lunchrooms.....

Get copies of all blank forms used.

Tabulate inspectors' records to ascertain:

- Time of arrival and departure
- Per cent of pupils examined
- Per cent having defects (classify)
- Per cent recommended for treatment
- Per cent receiving treatment (classify)
- Per cent reexamined after treatment claimed
- Per cent failing to receive treatment.....Causes.....Classify
- Sources of treatment
- Number pupils examined by each inspector
- Number defects found by each inspector
- Number examinations made per hour by each inspector
- Time given to inspections by each inspector
- Standards of diagnosis and recommendations
- Number consultations with parents
- Number home visits
- Number treatments given
- Results of treatment for each sort of defect

Tabulate nurses' records to ascertain:

- Time devoted to school
- Time devoted to home visits
- Time lost by absence or tardiness
- Number inspections made
- Number defects discovered (classify)
- Number recommended for treatment
- Number receiving treatment (classify)
- Number consultations with parents
- Number home visits

Visit homes of certain number of defectives to ascertain efficiency of follow-up methods of inspector and nurse.

Make physical examinations; compare with physical record.

Make classroom inspection to see if pupils are seated with reference to defective vision and hearing.

Digitized by Google

For the Building—

Name of school.....Location.....Surrounding topography.....
Character of neighborhood.....Condition of adjacent streets.....
Number stories.....Number classrooms.....Condition of basement.....
Kind of building.....Date of construction.....Seating capacity.....
Present enrollment.....Boys.....Girls.....How often is building inspected as to sanitary condition?.....
Fire escapes.....Fire drills.....How often?.....Time required to empty building.....Stairs fireproof.....Hand rails on stairs.....Direction doors open.....Fire plugs, hose, pails, or chemical extinguishers.....
Size of playground.....Sunny and dry.....Character of pavement.....
Heating system.....Thermostats.....Sanitary condition of stairways and corridors.....System of ventilation.....
How often is building swept?.....By whom?.....When?.....
How often scrubbed?.....Are floors oiled?.....Is sweeping compound used?.....Dry sweeping.....What method of dusting.....
Are walls mopped?.....Are desks mopped?.....Disinfectants used.....
Any bathrooms?.....When open to pupils?.....Location of toilets.....Condition of sewerage.....How many urinals provided?.....
How many seats?.....Condition of floors and walls of toilets.....
Light.....Ventilation.....Odors.....Washbowls, sinks, soap and towels.....
How often is plumbing inspected?.....Source of water supply.....
Sanitary drinking facilities.....Common drinking cups.....
Location of cloakrooms.....Size.....Number hooks for each pupil.....Light.....Ventilation.....Provisions for drying wet clothes.....Sanitary condition.....Lockers.....

For the Room—

Number of room.....Floor and location.....Length.....
Breadth.....Height.....Seating capacity.....Number pupils.....Pupils face, N. E. S. W.....Number windows.....Location, N. E. S. W.....Height of sills.....
Distance from window top to ceiling.....Color of shades.....
Width of mullions and piers between windows.....Square feet outside window surface.....Area transom and hall window surface.....Ventilation, area of intake.....Of outlet.....
Position of each, distance apart.....Artificial light.....
When used.....

Digitized by Google

Location of radiators.....Provision for moisture.....Thermometer, location.....Temperature.....

Color of ceiling.....Of walls.....Of woodwork.....Position of blackboards, N. S. E. W.....Maps and blackboards between windows.....

Are windows freely used for ventilation?.....Are desks adjustable?.....Do they vary in size?.....Are pupils seated according to size?.....Are they seated according to defects of vision and hearing?.....

Draw diagram of room.

HOSPITALS AND CLINICS.

For the City—

Hospitals under supervision of the health department.....

Other city hospitals.....Private hospitals.....Capacities.....

General hospital facilities.....Emergency cases.....

Facilities for treating contagious diseases.....Diseases of children.....Maternity cases.....Tuberculosis.....Mental cases.....Venereal diseases.....

Free facilities.....Staff volunteer or paid.....Interns.....Nurses.....Nurses' training school.....Ambulance service.....

Home care of indigent sick: General cases.....Contagious cases.....Maternity cases.....Social service nurses.....

Convalescent piers, boats, camps, etc.....

Number of clinics.....Location in city.....

Supervision exercised by department of health.....

How supported.....Free service.....Free medicine.....

Class of cases treated.....Tuberculosis clinics.....

Dental clinics.....School service.....Medical staff.....

Volunteer or paid.....Nursing staff.....Social service nurses.....

For the Hospital—

Name.....How supported.....Location.....Cost of construction.....

Surroundings.....Grounds.....Capacity.....Average census.....

Class of cases accepted.....Free service.....

Number in visiting staff.....Volunteer or paid.....

Number interns.....How appointed.....Number nurses.....Training school.....Helpers.....Ambulance service.....

Sterilizing and operating equipment.....Maintenance cost per patient.....Death rate.....Laboratory facilities.....

Character of building.....Condition.....Number stories.....Fire escapes.....Direction doors open.....Fireproof stairways.....Fire plugs and appliances.....Fire drills.....

Heating.....Lighting.....Ventilation.....Sewerage.....

Digitized by Google

Water closets.....Bathrooms.....Cleanliness of stairways and corridors.....Rooms.....Wards.....Kitchen.....
Operating room.....Interns' quarters.....Nurses' quarters.....Reports to whom.....How often.....Publication.....Records.....

For the Clinic—

(See Tuberculosis Clinic.)

LABORATORIES.

Laboratories in the city.....How supported.....
Supervision exercised by health department.....
Bacteriological laboratories.....Chemical.....Manufacturing.....
Staff.....Appointment.....Salary.....Term.....
Facilities for examination of milk.....Of water.....Of food products.....
Diagnostic facilities.....For whom available.....Free or for fees.....
Are culture media furnished free to physicians?.....
Are complete data required with each specimen?.....
Are contagious cases reported by laboratory to health department?.....
Records, how kept.....Number examinations made.....Classification of results.....

VITAL STATISTICS.

Under whose supervision?.....Employees.....Appointment.....
Salary.....Term.....What records kept?.....What indexed?.....
Form of records.....Description.....
Obtain samples of all blank forms.

DEATH RECORD.

Description.....Data called for.....Source of data.....
How are death certificates received?.....
Disposition of original record.....Neatness.....Completeness.....
Accuracy of arrangement.....Are all deaths probably reported?.....
Efforts to enforce reporting of deaths.....
Requirements to obtain burial permit.....Fee charged.....
Disposition of fee.....
Is International List of Causes of Death followed?.....
Is death rate actual or corrected?.....
Is there any record of residents dying outside the city?.....
Do cemeteries report burials to health department?.....

Digitized by Google

Time required to keep death record and index.....
On what population are vital statistics based?.....
True population.....
Are still-births entered among (a) births, (b) deaths, (c) both, or (d) separately?.....
Are deaths from contagious and diarrheal diseases kept by wards?.....
Are all deaths recorded by wards?.....
Are still-births included in estimating death rate?.....
Are non-residents included in death rate?.....
Are suspicious cases investigated?.....
Are deaths in hospitals so indicated?.....To whom are reports made?.....How often?.....
Index to death record, description.....Data given.....Neatness.....Completeness.....Accuracy of arrangement.....
Promptness of indexing.....
Tabulate death record for:
- Total number deaths
- Number deaths under 1 year, all causes
- Number deaths under 2 years, all causes
- Number deaths under 5 years, all causes
- Number deaths under 1 year, diarrheal diseases
- Number deaths under 2 years, diarrheal diseases
- Number deaths under 5 years, diarrheal diseases
- Deaths from each contagious disease
- Number still-births (if recorded here)
- Number non-resident deaths
- Deaths in hospitals and other institutions
- Undertakers recorded
- Cemeteries recorded

Compare:
- Death rate with that of other cities
- Death rate with city's former death rate
- Death rate from various contagious diseases, diarrheal disease, and age groups with other cities
- Death record with death columns of newspapers
- Burials attributed by death record to certain undertakers with undertaker's records
- Burials attributed by death record to certain cemeteries with cemetery records
- Deaths from each contagious disease with number of such contagious disease reported (case mortality)
- Deaths from tuberculosis with tuberculosis register
- Deaths attributed to hospitals and other institutions with records of these institutions
- Local records with records of state board of health

Digitized by Google

BIRTH RECORD.

Description.....Data called for.....Source of data.....
How are birth certificates received?.....
Disposition of original record.....Neatness.....Completeness.....
Accuracy of arrangement.....Time required to keep birth record and index.....Are births in hospitals so indicated?.....
Are births out of wedlock so indicated?.....To whom are reports sent?.....How often.....Any blank for supplementary information when birth is recorded before baby is named?.....
Number of unnamed babies recorded.....Are all births probably reported by (a) physicians, (b) midwives?.....
Efforts to enforce reporting.....
Are still-births included in estimating birth rate?.....
Index to birth record, description.....Data given.....Neatness.....Completeness.....Accuracy of arrangement.....
Promptness of indexing.....
Compare birth record with:

- Newspaper records of births
- Records of babies at infant milk stations
- Church records
- Deaths of infants under one year of age
- Infant mortality per 1000 births with that of other cities
- Birth rate and death rate
- Number births with number living children under 1 year of age (census years)
- Records of children's asylums and hospitals
- City's birth rate for past few years
- Results of house-to-house canvass
- Records of state board of health

MARRIAGE RECORD.

Description.....Data called for.....Source of data.....
Neatness.....Completeness.....Accuracy of arrangement.....
Requirements for obtaining license.....Fee.....Disposition of fee.....
Is certificate returned to health department?.....
Does marriage record contain record of licenses issued, marriages performed, or both?.....
Marriage rate.....

HEALTH EDUCATION.

Are systematic publicity campaigns conducted by the health department?.....By the child welfare division?.....

Digitized by Google

Medical school inspectors.....
Contagious diseases.....Tuberculosis.....Vital statistics.....
Other divisions.....
Publications of the department.....Reports.....
Does department conduct a bureau of information on health matters?.....Are physicians required to instruct patient and family in certain cases?.....
Are maps, charts, photographs, and diagrams employed?.....
Mass meetings for health education: Meetings of labor unions.....
Lodges.....Y. M. C. A.....School teachers.....Physicians.....Women's clubs.....Firemen and policemen.....
Clergymen.....Business clubs.....Industrial concerns.....
Illustrated lectures.....Exhibits.....Outdoor stereopticon exhibits.....Placards.....
Moving picture theaters.....Daily press.....Periodicals.....
Phonograph lectures.....Sermons.....Leaflets.....Industrial bulletins.....Street car and theater tickets.....Pay envelopes.....Tag days.....Clean-up days.....Red Cross seals.....Anti-spitting signs.....Civic organizations coöperating.....
Efforts to prevent duplication of function.....
Boys' and girls' clubs.....Recreation centers.....Playgrounds.....

Digitized by Google

NEWS AND COMMENT

The eleventh annual meeting of the American Society of Tropical Medicine will be held in Boston May 29-30, 1914.

Lieut. Elmer S. Tenny, U. S. A., has left the Philippines and is now stationed at Fort Baker, California.

The Indian Medical Record, formerly at Bowbazar, Calcutta, India, is now located at 2, Horokumer Tagore Square, Corporation Street, Calcutta, India.

Dr. Richard P. Strong, formerly of the Biological Laboratories Bureau of Science, Manila, P. I., is now directing the Department of Tropical Medicine, Harvard Medical School, Boston, Mass.

The order of the New York City Board of Health adopted several months ago, requiring the pasteurization of all except certified and guaranteed milk, will be enforced by Commissioner Goldwater, notwithstanding many protests.

The St. Louis Board of Health has issued an order prohibiting the use of restaurants, butcher shops, groceries and other food dispensing shops as laundry agencies, owing to the liability of spreading diseases carried in the bundles.

Dr. John W. Long, of Greensboro, S. C., has donated a fund to the Foreign Mission Board of the Methodist Episcopal Church for the purpose of erecting a hospital at some conveniently located point in South Africa for the treatment of diseases peculiar to that country.

It is expected that all exhibition buildings for the Panama Exposition will be completed and ready for the installation of exhibits by July 1, 1914. Two hundred and twelve national and international congresses have already planned to meet in San Francisco during the Exposition.

Digitized by Google

The Third International Congress of Occupational Diseases will be held in Vienna in September, 1914. The attention of the medical profession and all others interested in the prevention of occupational diseases has been invited to this congress, the first of which was held in 1906.

Eleven institutes of child hygiene have been established in connection with the various services of pediatrics and obstetrics in Paris. This was done in order to enable all Parisian mothers to gain a more adequate knowledge of child hygiene. Annual reports will be made by the heads of these institutes.

On February 4 there was held in New York a meeting of the private health agencies of that city. A plan was adopted for the organization of the Health Federation of the City of New York, in which 150 societies are interested. A committee of 15 members, to be known as the Central Council of Public Health, is part of the plan.

President Harry Pratt Judson of the University of Chicago and Dr. Francis W. Peabody are to be in China from March until November for the purpose of studying the methods of public health protection and the study and practice of medicine there. Dr. Judson is a trustee of the Rockefeller Foundation, under whose auspices the party will go.

The Southeastern Sanitary Association, organized in Greenville, S. C., last May, held its first annual meeting in Columbia, S. C., February 13 and 14. Dr. J. LaBruce Ward, Columbia, S. C., director of rural sanitation of the Rockefeller Commission for the Study of Hookworm, was elected president; Dr. Charles E. Terry, Jacksonville, Fla., vice president; Clarence E. Smith, D. V. S., Greenville, S. C., secretary-treasurer.

Great reductions have been made in the appropriation bill reecntly passed by the Lower House of the Philippine Legislature. As a great part of the appropriation of the health department in former years has been spent for the upkeep of orphan

Digitized by Google

asylums, the care of insane and the segregation of lepers, and as these obligations are to continue as usual, great concern is felt for the health work of the Philippines.

The report of Dr. C. L. Pridgeon, secretary of the North Carolina State Board of Health, for the eradication of hookworm disease, shows that progress is being made in this line. Of the 217,033 persons examined in the state prior to 1913, 40 per cent were found infected. Of the 107,887 examined during 1913, only 21.8 per cent were found infected. One-seventh of the state's population has been examined by the hookworm staff of the State Board, who have also delivered 1,089 lectures and distributed nearly a million pamphlets.

The following is an extract from the executive order in regard to the permanent organization of the Canal Zone and establishment of the Health Department: "There shall be a health department under the direction and supervision of the Chief Health Officer. This department shall be charged with all matters relating to maritime sanitation and quarantine in ports and waters of the Canal Zone, and in the harbors of the cities of Panama and Colon; and with land sanitation in the Canal Zone, and sanitary matters in said cities in conformity with the Canal Treaty between the United States and the Republic of Panama and existing agreements between the two governments thereunder; and all matters relating to hospitals and charities."

In commenting upon the recently established Arkansas State Board of Health, the Arkansas Democrat says: "An entirely new conception of public duty has been forced on our lawmakers in this respect, and now for the first time in the history of Arkansas, our vital resources—men, women and children—are to receive the same governmental care and protection as our soil, rivers, forests, hogs, cattle and horses. Ten years ago it would have been impossible to pass the law under which the new State Board of Health is operating, notwithstanding the fifty years of successful experience in New York, Pennsylvania and Massachusetts in public health administration. It

Digitized by Google

has taken years of energetic, unselfish and unremitting effort to bring the Southern States to a commitment of the truth that the protection of the public against preventable disease is a fundamental duty of state government."

Public Health Activity.

CALIFORNIA.—*San Francisco.* The anti-plague report of the United States Public Health Service in San Francisco shows that the last case of human plague occurred there January 30, 1908, and the last case of rodent plague, October 23, 1908. The report shows the great amount of work done in inspecting premises, killing rats, and carrying out other methods of plague eradication.

MICHIGAN.—(*Public Health,* February, 1914.) This number is devoted to the program given at the First Sanitary Convention, held in Jackson, January 13-14, 1914. Among the interesting articles is one by Edward D. Rich, State Sanitary Engineer, on "Water Supply and Sewage Disposal." He states that in Jackson the annual budget for 1912-1913 for the fire department was $50,460; for the police department, $32,925, and for the sanitary fund, $4,205, which means that each person is paying $1.26 toward protection from fire, 81.3 cents toward protection of personal property by the police department, and only 10.5 cents for the conservation of human life.

NEW YORK.—(*Monthly Bulletin,* January, 1914.) The New York Department of Health began the year with a bulletin devoted entirely to vital statistics. Besides comprehensive tables and statistical data, the Bulletin contains an article on "The Importance of Vital Statistics in Public Health Work," by Dr. Shirley W. Wynne.

NEW YORK.—(*New York City Weekly Bulletin.*) In the February 7 number of the Bulletin the Department of Health commenced the weekly publication of all prosecutions for violation of the Sanitary Code. The names and addresses of the vio-

Digitized by Google

lators and the character of the violation will be given. The Department states that it "believes that full publicity in connection with work of this kind is one of the best means to secure compliance with public health regulations."

NEW YORK.—(*New York City Weekly Bulletin,* February 28, 1914.) Health Commissioner Goldwater refutes a charge that children, especially those suffering from contagious diseases, and treated at some of the city hospitals and hospitals connected with the Department of Health, have been experimented upon. The charge has been investigated and proved to be entirely without foundation.

Digitized by Google

CURRENT LITERATURE

PLAGUE. THE EPIDEMIOLOGICAL FEATURES OF BUBONIC AND PNEUMONIC PLAGUE CONTRASTED.—(*Jour. Trop. Med.*, 1913, XVI, 273.) W. Glen Liston points out that the historical writers concerning plague fail to differentiate between the bubonic and the pneumonic forms of the disease. The differentiation is not always easy to make because the bubonic type is often complicated by a secondary pneumonia. In true pneumonic plague, however, large numbers of plague bacilli are found in the sputum, so that the differentiation can be made. The paper refers to the discovery of the connection between the disease in rats and in man and to the discovery of the flea as the vector of the virus. He points out that the International Commission, appointed by the Chinese Government in 1911, showed that the epidemic of pneumonic plague in Manchuria was spread by direct man-to-man infection. Strong showed that the bacilli isolated from pneumonic cases are identical with those isolated from bubonic cases. The author believes plague bacilli will live longer in a cold, damp atmosphere, after being ejected during coughing, than in a hot, dry one. This would account for the more common occurrence of epidemics of the pneumonic form of the disease in cold and temperate climates than in hot tropical countries. Experiments conducted in India have shown that rats from certain localities are more susceptible to plague than those from other localities. The immunity of the rats was greatest in places which had suffered most severely from plague, less marked in those places which had suffered to a moderate extent, and least in those places in which plague had not occurred. The immunity exhibited by the rats from a plague district seems to be a natural, inherited immunity. The conclusions concerning the immunity of *Mus rattus* do not seem to be applicable to the immunity of *Mus decumanus*. John M. Swan.

ENTERIC FEVER IN INDIANS, WITH SPECIAL REFERENCE TO ITS OCCURRENCE IN THE INDIAN ARMY.—(*Jour. Trop. Med.*, 1913, XVI, 280.) Captain R. A. Chambers finds that typhoid fever is a common enough disease amongst the East Indians, although it is not as common amongst the native troops as amongst European soldiers. The mortality is higher, however, amongst the former than amongst the latter, either in tropical or in temperate climates. The most valuable method of diagnosis is the early use of the blood culture. He recommends that the inoculation of sodium taurocholate medium be made before the seventh day of the disease. A slow pulse in relation to the degree of fever is of important diagnostic significance, and early dicrotism is of importance. Malaria and typhoid may coexist. High continued fever is the general rule and complications are exceptional. J. M. S.

Digitized by Google

INVESTIGATIONS AS TO THE RELATIONSHIP OF THE TARBAGAN (MONGOLIAN MARMOT) TO PLAGUE.—(*Jour. Trop. Med.*, 1913, XVI, 275.) Dr. Wu Lien Teh contributes a very interesting summary of an investigation undertaken by the North Manchurian Plague Prevention Service for the purpose of determining the relation of the tarbagan, a rodent similar to the American woodchuck, to the spread of plague. He finds that although the tarbagan occasionally suffers from plague the epizootic is never extensive and the relation of the animal to human plague may be considered negligible. From the writings of Russian authorities it appears that plague has existed for many years in various parts of Siberia, sometimes in the bubonic form, at other times in the pneumonic form. These places may be looked upon as endemic foci. J. M. S.

SOME RESULTS OF MEASURES TAKEN AGAINST BERI-BERI IN BRITISH MALAYA.—(*Jour. Trop. Med.*, 1913, XVI, 282.) W. L. Braddon presents some interesting statistics resulting from the substitution of whole rice for white rice. In the Singapore prison, in the Singapore lunatic asylum and in the Selangor lunatic asylum the disease was abolished. In Tan Tock Seng's Hospital, Singapore, the mortality was reduced from 48 per cent. to 10 per cent. In the Durian Daun Hospital, Malacca, from 30 per cent. to 9.2 per cent. In the Jasin Hospital, Malacca, from 24 per cent. to 9.2 per cent. In the Batu Gajah Hospital, Perak, from 60 per cent. to 16 per cent. In the Kampar Hospital, Perak, from 46 per cent. to 16 per cent. In the Christmas Island Hospital, from 10 per cent. to 2 per cent. J. M. S.

THE PRESENT STATE OF THE STUDY OF BERI-BERI IN JAPAN.—(*Jour. Trop. Med.*, 1913, XVI, 283.) S. Shibayama says that those who are studying beri-beri in Japan have not yet been able to arrive at any conclusion. Rice as well as a monotonous and one-sided diet may give rise to the onset of the symptoms, but they cannot be assumed to constitute the cause of the disease. The symptoms and anatomical changes seem to develop from intoxication by a poison which is produced by a certain kind of micro-organism in the human body, especially the intestine. This hypothesis may explain the geographical and seasonal prevalence, for if the disease were caused exclusively by deficiency of a certain kind of a nutriment they do not see why it should not occur among other nations as well as among those of the Far East. J. M. S.

ULCERATED AND SWOLLEN GUMS IN INDIAN TROOPS.—(*Jour. Trop. Med.*, 1913, XVI, 286.) Colonel P. Hehir calls attention to the prevalence of ulceration, sponginess and swelling of the gums among Indian troops. It is frequently associated with some denudation of the epithelium of the tongue, small ulcers, and a varying degree of oral sepsis. At first sight it has the appearance of pyorrhea alveolaris; but it is curable in two weeks by such local applications as tincture of iodine and antiseptic mouth washes, without loss of teeth. J. M. S.

Digitized by Google

EMETINE IN ABSCESS OF THE LIVER.—(*Bull. de la Soc. de Path. Exotique*, No. 10, 1913.) Drs. L. Gaide and P. Mouzels give the results of their experience with emetine in three cases of suppurative hepatitis occurring in the course of latent intestinal amebiasis. The first case was a soldier, age 30, who had seen service in Africa and Madagascar. He had unilocular abscess of the liver, following an attack of acute dysentery. On exploration, at a depth of six centimeters, an abscess was encountered in the liver in the sixth intercostal space. The cavity contained 350 grains (about 11 ounces) of pus that was shown to be sterile. The day after the evacuation of the pus, the emetine treatment was instituted. Four centigrams of emetine were given daily by intramuscular injection; the treatment was kept up for nineteen days. Twice after the first evacuation, one week apart, the pus reaccumulated; 175 grams of pus the first time and 300 grams the second time. A few days after the last aspiration, the abscess was opened with the thermo-cautery, and drained. The patient was discharged cured about four weeks later. The second case was also one of unilocular abscess, treated by aspiration and emetine, with cure. When the clinical history pointed to hepatic abscess, an aspirating needle was introduced through the eighth intercostal space and 300 grams of pus were withdrawn. This pus was sterile. The patient received, for eight days, a daily intramuscular injection of four centigrams of emetine. Thymol was also administered internally for fifteen days. The patient made prompt recovery. The third case was a very aggravated one. At first, he had a single abscess of the liver, from which he apparently recovered. During convalescence, there was a relapse, resulting in the formation of multiple abscess of the liver, together with bronchial and gastric vomicæ. The abscesses were evacuated, first with a needle and then by hepatotomy, and emetine was administered. The patient recovered. He was in a desperate condition, and ordinarily would have succumbed to the disease. During the four months and a half that he was under treatment, his liver was punctured many times. The clinical history is a varied and remarkable one. The courage of the patient and the devotion of the surgeons were rewarded by eventual recovery. Several remedies were ordered as the patient's condition required, but emetine was emphasized. In their remarks, the authors say that Case 2 was an exceptionally favorable one, for, even before emetine had come into use, cases of small hepatic abscess had been known to recover after exploratory puncture. The third case shows clearly that we should not expect such a good result in every case. It also shows, in a striking manner, the active part played by emetine. Anyone who has practiced in the Tropics and has seen cases of multiple abscess of the liver, knows that they are almost invariably fatal. The third case was almost at death's door, and emetine was largely instrumental in preventing death. To sum up: emetine is a marvelous agent in the treatment of hepatic abscess; it promotes the repair of the tissues, and ought always to be used. Its action, however, is of itself

Digitized by Google

not sufficiently powerful to render surgical intervention superfluous. The old surgical rule: *ubi pus, ibi incisio,* is just as applicable in these cases as in any others. A. McShane.

EXPERIMENTS OF THE TRANSMISSION OF HUMAN TRYPANOSOMES OF AFRICA BY MEANS OF THE STEGOMYIA FASCIATA.—(*Bull. de la Soc. de Path. Exotique,* No. 1, 1914.) The *Stegomyia fasciata* possesses a melancholy interest for us as being the indispensable agent in the transmission of yellow fever; now, however, it adds another to its list of pernicious activities by carrying trypanosomes (of sleeping sickness) to human beings. Drs. E. Roubaud and A. Lafont report the results of their investigations in their laboratory in Dakar, French West Africa. Their studies extended over three months. The mosquitoes, preponderatingly *Stegomyias,* were hatched in a wire cage two meters high and a meter and a half in width and depth. Once every day, experimental animals were placed in the cage and were shaved on the back to a greater or less extent. We need not give the results of their experiments in detail. The investigators sum up their observations as follows: "As may be seen, the transmission of the virus was only effected in those cases where the animals were placed very close to the virus-carriers that carried a large number of trypanosomes in their blood. The mosquitoes, left to themselves, only diffused the virus in a mechanical way and at close quarters. A distance of one meter was sufficient to protect animals freely exposed to mosquito bites. We must say, however, that the large number of negative results in these experiments does not represent the absolute truth with regard to the possible transmission, in nature, of trypanosomes to man by means of the mosquito. The animals used, rats and guinea pigs, which were small and covered with hair, are much more difficult to inoculate than men, particularly half-naked natives. The monkeys used were vulnerable only on the denuded part of the body. Our experiments confirm the possibility of the rôle of mosquitoes as mechanical carriers of trypanosomes in limited spaces. They also show that the virus preserves its vitality in these insects for more than 24 hours." A. McS.

EARLY BONY LESIONS IN LEPROSY AS SHOWN BY RADIOGRAPHS.—(*Bull. de la Soc. de Pathol. Exotique,* January 1, 1914.) Dr. P. Colombier presents two radiographs of the feet in leprosy. He found changes in the bones that the usual clinical examination failed to reveal. The change noted was a loss of substance (atrophy) of the terminal phalanges. These little bones, instead of aiding, as in health, in a rounded extremity, are clearly beveled, as though they had been cut surgically. In one of his cases, the left foot was chiefly affected: the first, second and fifth toes were diseased; on the right foot, the second and fifth were diseased. In the other case, the change was clearly marked only on the second toe; but, in this case, the nasal bones were the seat of an atrophic process. A. McS.

Digitized by Google

A SUCCESSFUL CAMPAIGN AGAINST BUBONIC PLAGUE IN MEXICO.—Dr. Octaviano Gonzalez Fabela, Mexican delegate, contributed a very interesting paper on the bubonic plague at the International Plague Conference held at Mukden, in Manchuria (China), in April, 1911. Dr. Fabela, in accordance with the opening address of the president, Dr. Alfred Sze, laid stress on the practical aspect of the subject. He said that in his country an epidemic that had already gained much headway was rapidly controlled and stamped out. In the late months of 1902, the bubonic plague for the first time invaded Mexico, appearing on the Pacific coast, in the City of Mazatlan, State of Sinaloa. The infection probably came from San Francisco, Cal. The disease became epidemic, but the vigorous measures put in force soon conquered it. Inasmuch as none of the physicians of Mazatlan had ever seen bubonic plague before, the disease passed unrecognized at first, and thus made rapid progress. When Fabela was sent, as bacteriologist, from the Superior Council of Health, to identify the disease, he had no trouble in isolating and identifying the germ, for, when he arrived in Mazatlan, all of the clinical types of the disease were found. Following the accepted technic, he succeeded, in five days, in identifying the organism according to all of the tests laid down by Yersin and Kitasato. The health officials had to deal with a full-blown epidemic, and a vigorous plan of action was carried out under the direction of the Superior Council of Health, through its eminent president, Dr. D. E. Liceaga. Mazatlan had a population of about 18,000 when the disease first broke out; but fear drove out many, and the population decreased to 10,000 during the worst days of the epidemic. In all, there were 434 cases of plague; of these, 335 died, giving a mortality of 77 per cent. The first case occurred probably on October 20, 1902, seven days after the arrival of an infected steamer from San Francisco; the last one occurred on March 17, 1903. The disease presented an epidemic character from the middle of December to the beginning of March. The bacteriological diagnosis was made on January 3, and the campaign practically began about the middle of this month. The Federal Government, the State of Sinaloa, and many public-spirited citizens contributed to the stamping out of the disease. The means employed in combatting the plague embraced: (1) vaccination; (2) daily domiciliary visits, leading, if necessary, to (3) isolation of infected individuals in the pesthouse, or "lazaretto;" (4) isolation of suspected individuals from infected houses; (5) disinfection or burning of the infected houses; (6) disinfection or burning of all clothing and bedding of infected individuals and "suspects;" (7) medical examination of all persons desirous of leaving the port, for the purpose of preventing dissemination of the disease; (8) establishment of quarantine stations in the first localities through which emigrants from the port would have to pass, where they were kept under observation for 10 days; (9) destruction of rats.

1. When the sanitary personnel was completely organized, all the

Digitized by Google

members were vaccinated with the appropriate vaccine. Then all the inhabitants of the town were vaccinated. The total number of vaccinations was 15,260. The vaccines used were those of Besredkas and Haffkin; the latter was prepared at the National Bacteriological Institute of Mexico.

2. The City of Mazatlan was divided into various districts, each of which was placed under the charge of a physician; the medical officer instructed various individuals in the use of the thermometer and the general clinical examination of persons suspected of bubonic plague. The laymen so instructed coöperated with the physicians by reporting all persons presenting suspicious symptoms; and when the physician, on personal examination, found the person really attacked with the disease, he carried out the following program: (a) isolation of the patient in the lazaretto; (b) isolation of other occupants of the infected house in a place of detention; (c) disinfection of the house when practicable, or burning the house after appraising its value, for the purpose of indemnifying the owner; (d) disinfection or destruction by fire of the infected clothing and bedding; (e) distribution of new clothing to other occupants of the house.

4. The lazaretto was established on a small island, which offered ideal conditions for isolation.

5. "Detention houses" were established far from frequented thoroughfares, and kept under police supervision. The persons kept under observation were well provided with clean clothing and provisions during the time of their detention.

6. A skilled corps of disinfectors took charge of the work of disinfection.

The rats destroyed during the campaign against them numbered 14,000. —*Boletin del Consejo Superior de Salubridad*, Mexico, October 30, 1913.

A. McS.

DEMONSTRATION OF THE FUSIFORM BACILLI AND SPIRILLA OF THE MOUTH.—(Dr. Buard, in *Journ. de Med. de Bordeaux.*) One of the best staining methods consists in the use of the fourfold dilution of Ziehl's solution and Manson's borate-blue. In a few minutes, there is a distinct staining of the spirillar forms. The bacilli have a distinct spindle shape, slightly curved; they do not take the Gram stain, and the presence of deeply stained chromatin nuclei gives to some bacilli a granular aspect. The spirilla are markedly polymorphous, but always very (zart), with from three to seven regular and wide curves. With the carbonate-Giemsa stain, the fusiform bacilli appear violet, and the spirilla rose-red. Very good preparations, those which show the spirilla distinctly, can be obtained with Christof's method, with reduced silver; an alcoholic solution of nitrate of silver is poured on the preparation, which is placed on a window sill and exposed to diffused daylight. The chromatin elements of the fusiform bacilli stand out very prominently, and some of the stain as strongly as the bacilli. By using reducing agents (pyrogallic acid, hydroquinone, menthol, the intensity of the silver deposit can be increased with-

Digitized by Google

out blurring the outlines of the organisms. With India ink, results are obtained similar to those seen in a dark-field illumination; the bacilli and spirilla appear quite clear, that is when an objective with a diaphragm is used. Inasmuch as, in the investigated case of Vincent's angina, the specific excitors were found almost without admixture of other bacteria, Dr. Buard undertook to cultivate them on human blood-serum; one tube remained sterile; in a second tube, staphylococci and diplococci developed which multiplied in a daughter-culture so greatly that the specific organisms disappeared.—*Deutsche Med. Zeitung.* A. McS.

Acid Saturation in General Infectious Fevers.—(*La Escuela de Medicina*, Guatemala, October, 1913.) Dr. Enrique Pallais gives the results of many years of close, systematic observation on many cases of general infectious pyrexias. He believes he has found a remedy of indisputable efficacy, sure and rapid in its action, and one which fills a gap in the treatment of these diseases. He refers to the saturation of the system with citric or tartaric acid, in massive doses. Fifteen years ago, he observed that in malarial toxemia quinine dissolved with citric or tartaric acid and administered by mouth gave better results than when administered hypodermically. The difference could not be due merely to rapidity of absorption, so Dr. Pallais concluded that the acid must exert an action proper to itself, and independently of the quinine. He tried the citric and tartaric acids in all forms of malarial fever, and always with gratifying results. Indeed, in some cases that had resisted quinine, these two acids proved to be a veritable remedy, which may thus be used as a substitute for quinine. His observations have been careful, systematic and comparative, covering a good many years. The results are brilliant, beyond doubt. From 15 to 30 grains in twenty-four hours invariably give good results. The acid treatment may advantageously be combined with quinine, giving the latter hypodermically and the citric acid by mouth. In atypical typhoid.—All physicians who have practiced in the Tropics are familiar with cases of prolonged fever that simulates typhoid, or malaria of a continued type, presenting symptoms of both affections in varying degrees. It is oftimes difficult to make a clear diagnosis. Quinine is administered, but without any effect, even in cases where a blood examination reveals the presence of the plasmodium; in other cases, this slow fever is found in non-malarial patients. On the other hand, the typhoid symptoms may not be complete, and frequently the bacterio-chemical reactions do not manifest themselves. It is also to be remembered that in the Tropics, typhoid fever rarely occurs in its classical form. In all these cases, we have not had, until now, a specific treatment that would satisfy the legitimate aspirations of the physician to make himself the master of the situation, and enter the combat with the certainty of success. Dr. Pallais affirms now that the acid saturation of the organism fulfills these aspirations. The results of this treatment are so striking and prompt that he uses it to the exclusion of all other treatment, and he has

Digitized by Google

never had a fatal case with this method. Not only does it conquer in serious cases, but it also mitigates those cases in which it is instituted early in the attack. From the earliest days of its use there is a general improvement; the tongue, which is always coated in these cases, rapidly becomes clean; the intestinal disorders (tympanites, abdominal pain, constipation, fetor of the stools) improve; the patient becomes brighter, the fever falls, the skin becomes moist, the mouth is no longer dry. One of the most notable effects of the acid treatment is the rapid disappearance of *albuminuria*, which generally ceases entirely after a few days of treatment.

In hemorrhagic forms. Hemoglobinuric fever. Blackwater fever.—Among the various symptoms and manifestations that present themselves in the general and infectious fevers, the different hemorrhages constitute one of the phenomena in which the action of acid-saturation has a notable and sure effect. Dr. Pallais has not met a single case of hematuria or hema turesis or melena, etc., that did not yield completely in a few days to the influence of the acid. The effect was most marked and rapid in hematuresis. In two recent cases of hemoglobinuria, the urine became perfectly normal after a few days of treatment.

In yellow fever.—It is well known in places devastated by yellow fever that the juice of the lemon exerts a favorable influence; it is also well known that this agent is insufficient. Having tested the innocuousness of citric acid in massive doses, it occurred to Pallais that the supposed inefficacy or insufficiency of lemon juice (in lemonades) was due to the smallness of the doses employed, and he began to use it in large doses. In several severe cases of yellow fever, he gave as much as forty grams (620 grains) in twenty-four hours, in solution, distributed equally over the day and the night. The results were so wonderful that he could not describe them adequately. From his own experience as well as that of his medical friends who adopted his treatment, Pallais is convinced that the acid-saturation of the organism is the true and certain remedy in yellow fever. The improvement in all the symptoms is so rapid as to be surprising. Hemorrhage, epigastric pain, icterus, albuminuria, etc., quickly disappear, exceeding even the hopes of the physician. Some physicians used the treatment in cases that were considered moribund, or hopeless, and they made a good recovery. When used from the very beginning of the attack, it mitigates all the manifestations in a notable degree.

In Puerperal Fever. — Dr. Pallais has obtained equally good results in puerperal fever. In those cases that were complicated with paludism, the remedy acted with equal efficacy. He has many observations, which he has not yet published. In regard to its *modus operandi*, Dr. Pallais believes that by diminishing the alkalinity of the blood, it renders the circulating fluid less appropriate as a culture-medium for the invading organisms. (We must also bear in mind that the citrates of the bases formed in the system eventually appear in the urine as carbonates.

Digitized by Google

Tr.) Dr. Pallais calls attention to the absolute inoffensiveness of the citric acid treatment. The only untoward phenomenon observed was a slight laryngitis, which disappeared as soon as the treatment was stopped. Dosage.—Pallais administers from 20 to 30 grams in twenty-four hours, dissolved in 300 grams of water (say, from 300 to 450 grains dissolved in 10 ounces of water); in severe cases, he gives as much as 40 grams. For children of 10 years, half doses; 5 years, quarter doses; nursing children stand from 2 to 5 grams daily very well. In combination with quinin, he uses the following formula: Quinin Sulphat., 1 gram; Ac. Citric, 12 to 15 grams; Aquæ, 120 grams. M. Sig.: Two tablespoonfuls every 2 hours.

A. McS.

THE CULTURE OF BABESIA (PIROPLASMA) CANIS IN VITRO.—(*Annals of Trop. Med. and Parasit.*, Vol. VII, No. 4, December 30, 1913.) Thomson and Fantham, by means of the Bass method, have succeeded in artificially cultivating *Babesia canis* and reinoculating dogs from cultures, thereby producing a virulent infection which resulted in the death of the animals. As many as 32 merozoites per corpuscle were obtained, and the various types found in the cultures were pyriform, ameboid, rounded and oval parasites, also evidence of binary fission.

P. L. Querens.

AN ETIOLOGIC STUDY OF HODGKINS DISEASE.—Second Preliminary Note.—(*Journal of the A. M. A.*, Vol. LXII, No. 7, February 14, 1914.) Bunting and Yates report the positive infection of monkeys by the diphtheroid bacillus found in the lesions of human beings infected with Hodgkins disease. The monkeys were first tested for the presence of tuberculosis by the Von Pirquet method, then kept under observation in order to eliminate any unknown existing disease. The results were interesting and may possibly clear the complex etiology of this obscure affection.

P. L. Q.

THE PROBABLE IDENTITY OF TRYPANOSOMA CONGOLENSE (BRODEN) AND T. NANUM (LAVERAN)—(*Annals of Trop. Med. and Parasit.*, Vol. VII, No. 4, December 30, 1913.) Blacklock and Yorke have concluded that *T. congolense* and *T. nanum* are identical, as proved by the successful infection of rats, mice, rabbits, goats, and guinea pigs by *T. nanum*. While the parasites are morphologically identical, being short aflagellar trypanosomes and measure 8-19 micra in length, the separate identification was formerly based upon the unsuccessful attempts to infect the above named animals with *T. nanum*. P. L. Q.

ORIGIN AND PRESENT STATUS OF THE EMETINE TREATMENT OF AMEBIC DYSENTERY.—(*Journal of the A. M. A.*, Vol. LXII, No. 7, February 14, 1914, pp. 501-506.) E. B. Vedder, in a lengthy article, contributes authentic data to enhance our present knowledge in treating this common af-

Digitized by Google

fection by our most valuable drug, emetine, an alkaloid of ipecac. Rogers most probably deserves the honor of first using it, he reporting his valuable results in 1912, and since this time it has been used with varyingly permanent successes throughout the world. It is also used with encouraging results in acute hepatic abscesses provided they are amebic in origin, and judging from the reports continually being published, it will replace the surgical methods for relief now being employed. The author concludes that emetine is a true specific for dysentery, whose etiological factor is the *Entameba histolytica*, when used hypodermically as the hydrochloride salt, and that it is most probably equally uneffective in bacillary dysentery, syphilis, rabies and trypanosomiasis. P. L. Q.

A Case of Amebic Dysentery of Thirteen Years' Duration Cured by Emetine Hydrochloride.—(*Journal of the A. M. A.*, Vol. LXII., No. 7, February 14, 1914, pp. 534-35.) G. W. McCaskey reports a case of amebic dysentery lasting thirteen years, which rapidly responded to the emetine treatment, after a recrudescence following a first, but interrupted, course of hypodermic injections of the hydrochloride salt. The author firmly believes that there can be no doubt as to the duration of the infection, on account of the typical history which agrees with those of this type of infection. The case (and others reported) is also interesting with reference to the location, for these infections are gradually being recognized in the northern part of the Mississippi Valley, which was practically considered free from amebic dysentery heretofore. P. L. Q.

The Effect of Cold Upon the Larvæ of Trichinella spiralis.—(*Science*, N. S., Vol. XXXIX, No. 996, pp. 181-183, January 30, 1914.) B. H. Ransom found from a limited amount of experimentation that *Trichinella* larvæ in pork survive exposure to a temperature of 11° to 15° F. for as long as six days. On the other hand, only one out of over 1,000 larvæ examined survived an exposure of six days to 0° F. temperature. Microscopic examination of more than 8,000,000 hogs in this country showed 2.57 per cent. to have been infected. This shows the great danger of infection from eating uncooked or undercooked pork. The author suggests that in view of the defects inherent in microscopic inspection, and provided his observations are confirmed, refrigeration "promises to afford a means of preventing trichinosis of far greater certainty, easier to apply, and less expensive than any method of trichina inspection yet devised." C. C. Bass.

Quarterly Report of Bureau of Health for the Philippine Islands, Third Quarter, 1913.—Victor G. Heiser, Director of Health, directs attention in this very important report to the presence of cholera carriers in times of outbreaks of cholera. During the time from August 24 to September 30, there were 72 cases of cholera in the City of Manila, with 45 deaths. The disease had been absent. No trace of the source of infection could be found. The first case occurred in a Filipino who

Digitized by Google

worked at a hotel as a carpenter, but took his meals at his home. A number of people, varying from none in a very few instances up to as many as 70, who were supposed to have come in contact with one or the other of the 72 cases, were examined and 40 found to be vibrio carriers and 29 true cholera vibrio carriers. The author states that "there is considerable evidence from an epidemiological standpoint, that cholera carriers are always present in the Philippines and under certain circumstances they are capable of transmitting the disease." C. C. B.

THE INFLUENCE OF THE MEDIUM IN WHICH THE PLAGUE BACILLUS IS PROPOGATED UPON THE FACILITY WITH WHICH IT IS INGESTED BY HUMAN LEUCOCYTES.—(*Jour. of Hygiene*, January, 1914. Plague Supplement III.) Ralph St. John Brooks determined the phagocytic index of fresh human leucocytes on an old laboratory strain of *B. pestis* grown in heated horse, rat, guinea pig and human serum. Practically the amount of phagocytes was about the same as it was when the original broth agar culture was employed. The author mixed a suspension of *B. pestis* obtained from the crushed glands of rats dead of plague, with his own serum and leucocytes. There was practically no phagocytosis, while in the control test with the same strain of bacilli that had not recently been passed through a rat there was the usual amount of phagocytosis. In a further experiment, organisms isolated from the heart of an infected rat were little susceptible to phagocytosis until they had been transplanted on broth agar each day for at least 4 days. After this time their susceptibility to phagocytosis rapidly increased until it was nearly as great on the seventh day as in the case of the control with the original culture. "Laboratory races of plague bacilli grown in fresh rat or horse serum show a high resistance to phagocytosis and are not ingested by human leucocytes to any appreciable extent." Since plague infected fleas do not go as long as four days without feeding, it occurs that the bacilli they contain are practically grown in rat blood and therefore possess this resistance to phagocytosis.

C. C. B.

THE INFLUENCE OF CULTIVATION IN SERUM-CONTAINING MEDIA UPON THE VIRULENCE AND IMMUNISING PROPERTIES OF THE PLAGUE BACILLUS.—(*Jour. of Hygiene*, January, 1914. Plague Supplement III.) Sidney Rowland discovered that while a plague vaccine made from broth-cultivated organisms induces a high degree of immunity in rats against organisms cultivated in the same medium, they fail to produce any considerable protection against the same strain of bacilli when grown in blood serum. The importance of these observations is obvious. The bacilli inoculated into man by fleas have been grown in the septicemic blood of an infected rat from which they were obtained or in blood obtained subsequently from other rats. "The habits of the fleas insure a constant supply of fresh serum to replace that digested or voided." Rowland grew *B. pestis* in fresh horse serum, fresh rat serum and heated (50° C. 30 min.) horse

Digitized by Google

serum and inoculated several rats with 5,000,000 bacilli from one or the other culture. Of 67 inoculated with the fresh horse serum culture, 49 died. Of 10 inoculated with the fresh rat serum culture, only 2 died. Of 40 inoculated with the heated horse serum culture, all died. It appears that organisms grown in heated serum are thereby much increased in virulence. A vaccine was made from broth-grown bacilli and 47 rats were immunized with it. Twenty-two of these were given the usual test dose of broth-grown bacilli. Seventeen survived. The remaining 25 were given a similar dose of the same strain grown in heated serum. Only 7 survived. Next a series were immunized by a preliminary dose of nucleoprotein extract and subsequently inoculated with the living culture. Twenty-four days afterward the 17 that survived were each given 5,000,000 bacilli from a heated serum culture, a dose which killed all of the 20 unprotected rats and 72 per cent. of rats previously vaccinated with nucleoprotein prepared from broth culture. Every one of the series survived the inoculation. "It is therefore possible to immunize against the enhanced virulence of the serum race by the employment of living cultures."

C. C. B.

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed.

REPORTS.

QUARTERLY REPORT OF BUREAU OF HEALTH FOR THE PHILIPPINE ISLANDS. THIRD QUARTER, 1913.

In this quarterly review of health conditions in the Philippines, Dr. Victor G. Heiser, Director of Health, reports a case of plague occurring in Manila. Mr. William Crozier, editor of the Manila Daily Bulletin, was taken violently ill on September 19. The next day his case was diagnosed plague and the following day he died. Upon examination of his office a dead rat was found in the drawer of his desk and also several fleas. The former was ground up and inoculations were made into healthy laboratory rats, producing typical cases of plague in them. In the grocery store and restaurant on the first floor four other dead rats were found, all showing signs of having died of plague. It was learned that a Chinaman employed in the grocery store had died suddenly on September 20 of what was supposed to be pulmonary tuberculosis and had been buried immediately. The body was exhumed and it was definitely decided that death was not caused by tuberculosis. Large glands and other lesions indicated that he might have died of plague, but decomposition was so far advanced that it was impossible to make a positive diagnosis. The report goes on to show that notwithstanding an outbreak of cholera in the lat-

Digitized by Google

ter part of the quarter, the death rate had decreased 677 in 1913. Dr. Heiser states that if the high infant mortality could be excluded, Manila would compare favorably with the healthiest cities in the United States.

M.

TRANSACTIONS OF THE ENTOMOLOGICAL SOCIETY OF LONDON FOR THE YEAR 1913. Part III. London. January 21, 1914.

Part III of the Transactions of this Society is at hand and contains the latest interesting revelations in entomology, especially of our tropical species of insects. One of the interesting short articles is "On the Urticating Properties of *Porthesia similis*, Fuess.," by Harry Eltringham, who is in favor of the mechanical rather than the chemical theory and in the adult it is probably due to the presence of barbed spicules situated in the oral tuft, while in the larvæ "the large branched hairs which cover them certainly serve to hold loose spicules, although this may be only a part of their function, and they are probably also mechanically protective." The article is accompanied by four figures illustrating the spicules. The second paper is that of the Rev. F. D. Morice, "Illustrations of the Specific Differences in the Saws of the Female Dolerids." This group of sawflies was formerly classified by the *margins* of the saws, but to quote the author: "Others, to my mind quite as important, and often more immediately recognizable, occur in connection with the surface (not the edge) of certain saws, and especially with the remarkable alternating elevations and depressions ('ridges and furrows') which invariably cross these surfaces diagonally, but must generally be ignored in the outline drawing." The paper is illustrated with three plates. The third and largest paper was presented by W. A. Lamborn, "On the Relationship Between Certain West African Insects, Especially Ants, *Lycaenidæ* and *Homoptera*." This was then augmented by notes on new species by G. T. Bethune-Baker, W. L. Distant, Harry Eltringham, Prof. E. B. Poulton, J. Hartley Durrant and Prof. R. Newstead. The author observed while working in a bush camp at Oni, Southern Nigeria, that a close relationship exists between the West African Lycaenid butterfly larvæ and the ants, resulting in the common good of both, representing a sort of symbiotic existence. In other instances a triple association has been found to exist between Lycaenid larvæ, ants, and Homoptera, in which the larvæ, though treated as honored guests by their ant hosts, repay them with the basest ingratitude by devouring their fellow-guests, the Homoptera. Four plates are presented. Malcolm Cameron, in the fourth paper, "Descriptions of New Species of Staphylinidæ from India," describes thirty new species captured in the Nilgiri Hills, South India, North India, Ceylon, Assam, and Northwest India. The last paper was contributed by W. J. Kaye, entitled "Additions and Corrections to My Catalogue of the *Lepidoptera Rhopalocera* of Trinidad (1904)," accompanied by one plate illustrating new species and forms of these beautiful South American butterflies.

P. L. Querens.

Digitized by Google

REPRINTS.

BACOT, A. W., AND MARTIN, C. J. LXVII. Observations on the Mechanism of the Transmission of Plague by Fleas. Rep. from the *Jour. of Hygiene*, Plague Supplement III, January 14, 1914.

BAHR, PHILIP, AND LOW, G. C. A Case of Tuberculosis with Special Involvement of the Heart. Rep. from *The Lancet*, February 10, 1912.

CASTELLANI, ALDO, AND LOW, G. C. The Rôle played by Fungi in Sprue. Rep. from *The Jour. of Trop. Med. and Hygiene*, February 1, 1913.

DEVALIN, HUGH. Typhoid Fever and Gastroenteritis. Rep. No. 157, *Public Health Reports*, December 19, 1913.

HOFFMAN, FREDERICK L. The Menace of Cancer. Rep. from the *Transactions of the American Gynecological Society.*

HOFFMAN, FREDERICK L. The Statistical Experience Data of the Johns Hopkins Hospital Reports. Monographs, New Series, No. IV.

LOW, GEORGE C. The Absence of Eosinophilia in Chronic Cases of Helminthiasis. Rep. from the *Jour. of Trop. Med. and Hygiene.*

LOW, GEORGE C. A Note on the Pathology of Chyluria. Rep. from *Journal* of the London School of Trop. Med., Vol. 1, Part III.

LOW, GEORGE C. Cell Inclusions in the Blood of Blackwater Fever and Other Tropical Diseases. Rep. from *Jour. of Trop. Med. and Hygiene*, June 1, 1912.

LOW, GEORGE C. Persistence of Eosinophilia and Persistence of Absence of Embryos in Peripheral Blood in a Case of *Filaria Loa* Infection. Rep. from the *Jour. of Trop. Med. and Hygiene*, February 1, 1912.

MARTIN, CHARLES J. Insect Porters of Bacterial Infection. Rep. from *The Lancet*, January 4, 11, 1913.

MITZMAIN, M. BRUIN. Experimental Insect Transmission of Anthrax. Rep. No. 162 from Public Health Reports, Jan. 9, 1914.

PHELPS, EARLE B. The Wilmington (N. C.) Water Supply. Rep. No. 161 from Public Health Reports, Jan. 9, 1914.

RUCKER, W. C., AND KEARNY, R. A. Tuberculosis in Switzerland. Rep. No. 158 from Public Health Reports, Dec. 26, 1913.

SMITH, F. C. Tuberculosis Sanatorium, Fort Stanton, N. Mex. Rep. No. 145 from Public Health Reports, October 17, 1913.

PRINTED AT THE TULANE UNIVERSITY PRESS, NEW ORLEANS, U. S. A.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CHARLES CHASSAIGNAC, M. D.
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine
JOHN M. SWAN. M. D., Secretary, American Society of Tropical Medicine } *Ex officio.*
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M, D., University of Pennsylvania
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. APRIL, 1914 NO. 10.

EDITORIAL

Hookworm Disease: A World Disease of Long Duration.—When hookworm disease was recognized in the laborers in St. Gothard's tunnel and in the Egyptian mines, and later in other parts of the world, including the southern portion of the United States, little was it then thought that the disease belted the globe and destroyed hundreds of thousands of lives yearly and led to the loss of countless millions of money through reduced efficiency of its victims. The Rockefeller Sanitary Commission for the Eradication of Hookworm Diseases has recently published (Publication No. 61) information bearing on this subject obtained from an investigation of the prevalence of the disease in foreign countries. The facts brought out are simply astounding, even to those who have given the disease considerable study and actually realize its importance in some particular locality or country with which they may be familiar.

Digitized by Google

The Commission has received reports from 54 foreign countries, in at least 46 of which the disease is general and widespread. In six others, Wales, Germany, Netherlands, Belgium, France and Spain, the disease is confined wholly or chiefly to mines in certain definite localities. If we add to the area and population of these 46 foreign countries which are infected the area and population of the 11 of our own States which are extensively infected, we have the enormous area of 14,974,307 square miles with its population of 940,644,020 in which the infection is general and widespread. The evidence at hand now indicates that in many of these countries the infection is very great and, in fact, abundant evidence indicates that it runs from 50 to 80 or 90 per cent of the population of many of them. In India alone, with her 300,000,000 population, 60 to 80 per cent of them harbor the parasite. In the southern two-thirds of the Chinese Empire there is extensive infection running as high as 70 to 76 per cent of the farming population of the Yangtse Valley. Extensive investigation by Ashford and King and others showed that about 90 per cent of the working population of Porto Rico are infected.

It would seem to be a very conservative estimate to suppose that of this 940,644,020 population of the known heavily infected part of the globe, at least 50 per cent or 470 million people have hookworm disease. This is a little more than one-fourth of the entire population of the globe, about 1,600,000,000. The loss of life, the loss of the pleasure of health, the loss of opportunity otherwise available and the financial loss through inefficiency to these nearly 500 millions of people is almost beyond human conception. All of these people feel more or less the effects of the disease. Among them may be mentioned lowered vitality, impaired mental and physical development resulting in reduced production in every line of endeavor, and actually in retardation of civilization.

Digitized by Google

The distribution of the infection all over every country of the world in a belt within the zone extending from parallel 36 degrees north to 30 degrees south means to any deep thinker that the disease has existed in man many hundreds and probably many thousands of years. One must wonder what stage of advancement and civilization man would have reached by this date had not this veritable monster interfered with the mental and physical development of every generation during the developing and learning period of life. And even now man is pouring daily into the ever empty stomachs of this blood-sucking parasite a veritable river of his lifeblood.

We envy the great philanthropist Rockefeller the place he has served on earth by contributing substantially and liberally towards work that will no doubt lead to great reduction and perhaps ultimately to the practical eradication of the disease in this country. In fact, may it not be hoped that the work of the Hookworm Commission now being extended to foreign countries will, if nothing more, direct sufficient attention to the vast importance of this scourge of mankind to lead to at least a material reduction in its ravages some time in the future?

C. C. Bass.

Preventive Medicine and Syphilis—Viewed strictly as an infectious disease, syphilis offers a wide field for the application of the modern principles of preventive medicine. In one form or another, syphilis is much more prevalent than is generally realized. Roux says it is accountable for the majority of pathological conditions. A great deal of this mass of sickness is preventable. In most cases the manner of infection and its likelihood are known, and there is considerable evidence that the use of antiseptics after exposure kills the parasite before it enters the body. After infection, the disease can be diagnosed on its first appearance and apparently can be aborted, in many instances,

Digitized by Google

by early intensive treatment with salvarsan and mercury. Even when a cure is not attempted, infectious lesions can be rendered harmless in twenty-four hours with salvarsan. Most of the later manifestations of the disease can be controlled by appropriate treatment.

When an attempt is made to apply these preventive measures, however, we come up against all sorts of complex social questions as a result of the sexual nature of the disease and it does not seem possible to carry out a logical sanitary campaign with notification, inspection, disinfection, etc. Under these circumstances the only way out seems to be to make the best of a bad situation by a modified sanitary program.

This consists first in the wide use of the Wassermann reaction, or serum test, in the form of surveys of infected families, of hospital patients, of candidates for various positions. etc. When the disease has been located in this way, or by other examinations, the second step is for hospitals to admit cases of syphilis for treatment and to furnish the necessary remedies. Hospitals in general have been backward about admitting such cases for various reasons, but this position cannot be logically held if hospitals are to do the work for the community which they claim to do and are supposed to do.

Aside from facilities for the Wassermann reaction, hospitals and dispensaries should be fitted with the dark field microscope for the early diagnosis of primary lesions. This method of diagnosis is now well established, but is still much neglected.

Much can also be accomplished by physicians and parents by refusing to allow marriage unless the persons concerned are entirely free from the disease according to modern standards.

In these ways and in other similar ones, a good deal can be done, even if a direct attack on the endemic source of infection is not practicable at present.

Digitized by Google

Prostitution in Europe.

"The aggressive conscience of the world has too recently awakened to have as yet achieved a great deal."

The above paragraph is quoted from Abraham Flexner's recently published work on Prostitution in Europe* and it sums up the conclusion to be drawn from the observations of the author, covering a wide field of study, embracing all of Europe excepting Russia, the Grecian Archipelago and the Iberian Peninsula.

Mr. Flexner's effort is purely analytical and in no sense an indictment. His field has afforded a great opportunity for comparative research and the student of sociologic and economic questions relating to what may be called the business of the publicist will find a mass of material for future expansion.

This work is one of several planned by the Bureau of Social Hygiene, and intended to start a general educational movement in the subject discussed, inaugurated and furthered by Mr. John D. Rockefeller, Jr., already prominent as a pioneer in the restriction of white slavery in the United States.

The movement is worthy, even if the road may be long to the achievement of results and the conscience of the world is far from aggressive as yet, even though it may have been roused from a long time lethargy.

Everywhere in Mr. Flexner's book there is the evidence of the influence of ancient custom brought down to modern usage and even if the various cities considered may vary in their interpretation of the status of prostitution the fact impressed upon the reader is that the existence of prostitution is deep rooted and that it has not yet made retreat before the attacks upon it, even though in some places it may have entrenched itself in new camps.

*Publications of the Bureau of Social Hygiene, New York. The Century Co., 1914.

Digitized by Google

The most patent observation in the work in hand is the apparent failure in results where regulation is practiced, and the comparatively better conditions where no regulation is attempted. Our observation might be better put if we had said the less bad conditions where no regulation is attempted, because nowhere can one find the condition which may be described by any comparative or superlative of "good."

That there is more or less unrest concerning the question of prostitution in Europe must be apparent to anyone who reads the book; but, at the same time, the very obvious conclusion must be drawn that nowhere is there any evidence of any intention to do away with the custom, and practically everywhere all authorities with vested power seem to accept the existence of prostitution as a traffic, not to be encouraged particularly, but to be looked upon as a necessary evil, more or less condoned.

Mr. Flexner has made it quite clear that systematic organization of prostitution in Europe is under ban and so far as houses of community residence are concerned, these are growing fewer and of less importance in the traffic, though still a vital issue in their relation to white slavery.

The book should be read by everyone interested in the question, for no commentary or review can be comprehensive enough to cover more than the salient points; the detail contained is enormous and the sources of information quoted make the work authoritative and fully descriptive of present-day conditions. As yet most of the discussions of prostitution in English text have been more or less sensational; this book has no such demerit.

We are impressed with the purely masculine atmosphere which is characteristic of all attitudes to prostitution as indicated in this work. Not that Europe is alone in this respect. As males that part of the human race is still too sexually preponderating to escape a selfish point of view or manner of action. Nowhere is the punishment or moral condemnation of the male *particeps*

Digitized by Google

delictus emphatic; practically throughout, the legal and the moral attack is on the woman as vicious.

The plane of thought in the "aggressive conscience of the awakened world" must change materially before much progress is to be made in the remedy of prostitution, and the definition of the term must be broadened so as to include the man who shares the offense against society—if not against the law.

The work of the Bureau of Social Hygiene should be encouraged by a wide notice and recognition of the propaganda issuing from its press; more than this, there must be a large following among those who teach, in and out of office, the public, so that some lesson may be learned among the many promulgated.

We must not dismiss the work of Mr. Flexner without a further notice on that chapter where he discusses Abolition and Disease, the phase which of all concerns the physician most. The provision for venereal cases in hospitals and a voluntary system for treatment prevails in most places; a few cities enforce hospital care.

With the various army corps as bases for study and comparison, probably because of statistical data available, the author summarizes the study in stating that venereal disease is one with other infections and contagions. All alike are subject to unaccountable ups and downs. The decline in recent years may be attributed to natural abeyance, the effort to maintain efficiency in army organization, including the health of the soldier unit, the consequent physical development of the soldier himself, and the gradually more temperate use of alcohol.

The final argument is carried in the acknowledgment of the advances in medical research in prevention, isolation and cure, the enlightment of those afflicted, or liable to infection.

The conclusion is that abolition is better than regulation, so far as prostitution is concerned, and that an accompanying cam-

Digitized by Google

paign of enlightenment through education may bring final results.

More such books for the profession and for the public are needed and the resultant education may carry enough reflex into the everyday household so as to create a higher sense of morality among men and women. At present this morality is only among those who have lived into a more refined civilization, which carries better sentiments and higher ideals. The mass of all peoples, no matter what the country, lacks the elemental sense of ideals and until these permeate there must be a doubtful issue in the betterment of the primeval practices, born almost wholly of natural instincts not yet crystallized into motives of community and, therefore, personal salvation.

Isadore Dyer.

Digitized by Google

ORIGINAL ARTICLES

ANKYLOSTOMIASIS

(Or Hookworm Disease).

By

C. M. FAUNTLEROY,

Passed Assistant Surgeon, United States Public Health Service.

Definition and Synonyms.

Ankylostomiasis is a toxemia due to the presence in the body of *Agchylostoma duodenale* (Dubini) and *Necator americanus* (Stiles), resulting in the production of a severe anemia, and a great variety of clinical phenomena. The disease is variously known as Hookworm disease, Uncinariasis, Miners' anemia, Egyptian chlorosis, Porto Rican anemia, etc.

Historical.

In the Ebers or Leipzig Papyrus of the sixteenth century—about 1550 B. C., there is found an account of a disease called A. A. A. and U. H. A., caused by a worm termed *Heltu*. This account has led many authorities to believe that the worm *Heltu* and the hookworm are one and the same, and therefore, that hookworm disease was known to the ancient Egyptians. It should be stated, however, that this account in the Ebers Papyrus, which represents the oldest written record of Egyptian medicine, does not establish beyond question of doubt the exact relation of the disease caused by the worm *Heltu*, and the disease caused by the hookworm. As a matter of interest it may be mentioned here that the Ebers Papyrus first existed in the form of engravings on pillars of stone, ascribed to the god Thot, who is believed by some to be the Egyptian Aesculapius.

The knowledge of the hookworm, and the disease produced thereby, if possessed at all by the ancients, seems to have been

Digitized by Google

absolutely lost, and it was not until 1838, when the hookworm was discovered by Dubini in the person of a peasant woman in Milan, that modern medicine knew of its existence. In 1846 Pruner found the hookworm in Egypt, and in 1851 Griesinger proved that the worm was the cause of Egyptian anemia. Wucherer, working in Brazil in 1872, found the worm to be the cause of tropical anemia (called 'Oppilacao'). It was Perroncito who made the discovery that the severe anemia affecting the miners working in the St. Gothard tunnel was caused by the hookworm. In 1878 Grassi and Parona discovered the ova in the feces.

In the New World the existence of a fatal disease of unknown etiology was recognized quite early. Thus Piso in 1648 described a fatal disease present in Brazil which was probably ankylostomiasis. The disease was later described by Labat in Guadeloupe in 1742, by Chevalier in St. Dominique in 1752, by Desportes in 1770, by Bayon in Cayenne in 1780, by Hunter in Jamaica and by Rodschield in British Guiana in 1796, by Edwards in Jamaica in 1799, by Pitt in the United States in 1808, by Chabert in 1821, by Castalnau in Peru in 1820, by Jobim in Brazil in 1835, by Clarke in West Africa in 1860. In 1786 a peculiar anemia was found to be prevalent among the miners in Hungary, and later in France, Germany, Belgium and Cornwall. The cause of this anemia was not understood until the hookworm was found in the bodies of the victims.

It was Dubini who, by his discovery of the worms in the cases of fatal anemia, definitely separated ankylostomiasis from other confusing conditions. He it was who named the worm *Agchylostome*, which means "bent mouth." In 1898 Looss worked out the method of infection by the skin, lungs and trachea. More recently Sambon, Fulleborn and v. Schilling-Torgau have traced another method of infection from the lungs via the blood-stream to the alimentary canal.

In 1902 Stiles discovered the fact that two different parasites were being confused under the term *Ankylostoma*, one of which corresponded to Dubini's *Agchylostoma duodenale*, and the other new parasite Stiles named *Necator americanus*. In 1902 Boycott and Haldane found the worm among the miners of Cornwall.

Digitized by Google

Geographical Distribution and Statistics.

Hookworm infection belts the earth in a zone about 66 degrees wide extending from parallel 36 north to parallel 30 south; practically all countries lying between these two parallels are infected. In Wales, Germany, Netherlands, Belgium, France and Spain, hookworm disease is almost wholly confined to mines. In many countries hookworm infection is extremely prevalent. It is estimated that about 940,000,000 people live in countries where this disease is prevalent. In 1904 it was estimated that about 90 per cent of the working population of Porto Rico were infected. Of the entire population of Colombia living below 3,000 feet above the sea level, 90 per cent have been estimated to be infected. The following estimates have been given of the degree of hookworm infection in different parts of the world: In British Guiana 50 per cent of the total population, the percentage of infection among laborers on the sugar estates being much greater; in Dutch Guiana the percentage of infection on many plantations will reach as high as 90 per cent; in French Guiana about 50 per cent; in Egypt about 50 per cent of the laboring population are infected; in Ceylon on many of the plantations the infection runs as high as 90 per cent; of the 300,000,000 of people of India from 60 to 80 per cent are infected; in the Malay States the infection runs from 47 to 74 per cent on the rubber plantations; in parts of the Chinese republic the infection ranges from 70 to 76 per cent among the rural population; of the entire population of American Samoa about 70 per cent were said to be infected. In British Honduras hookworm infection appears to be prevalent throughout the colony to the extent of about 70 per cent of the population. Of the 16,000 East Indian coolies living in Jamaica about 50 per cent are said to be infected, and the number of infected persons is being increased by the new arrivals from India. In Mexico the degree of hookworm infection is apparently much greater in the mining districts where it is reported to exist to the extent of about 50 per cent; Panama has been reported to be generally infected and to the approximate degree of 20 per cent; Venezuela is said to be infected to the extent of "a great part of its in-

Digitized by Google

habitants;" in Japan the infection is pretty generally distributed throughout the empire, but it is believed that the infection is much heavier in certain localities where conditions are most favorable; in Java the degree of infection is about 20 per cent; in Korea hookworm disease prevails to the extent of about 50 per cent of the population, but the farmers exhibit a much higher degree of infection, reaching about 70 per cent; in the Philippines systematic investigations have been made in many different localities, and the degree of infection was found to run from about 10 to 75 per cent; as a matter of interest it may be here stated that infection among the enlisted men in the army stationed in the islands is said to cause great loss of time. In Europe, Austria is mainly infected in the mining districts, but since 1907 the degree of infection has been much diminished by the enforcement of rigid sanitary measures; in Belgium hookworm infection is reported to be present to the extent of about 5 to 23 per cent, being much greater among the mine workers and brickmakers; in Bulgaria it is interesting to note that up to 1911 no hookworm infection was discovered; in France hookworm disease is mainly confined to the mining population, and the degree of infection appears to vary considerably from mine to mine, ranging all the way from no infection up to 74 per cent; in Germany the disease is distributed mainly among the mining class, the degree varying from about 20 to 50 per cent; in Italy "the infection seems to be relatively light;" in Netherlands the infection exists among miners and brickmakers to the extent of about 14 to 21 per cent; in the mining region of Spain "the number infected reached 80 per cent of the total number of workers;" Switzerland, since the enforcement of rigid regulations, following an investigation of the well-known outbreak of hookworm disease among the workmen in the St. Gothard tunnel (1879-1880), has been kept free of hookworm infection; in Great Britain "there is no evidence of infection outside the tin mines of Cornwall;" in the United States, quoting from the Annual Report of the Surgeon-General of the Public Health Service of the United States, 1912, page 33, the following is given as the degree of hookworm infection in the various States: "Hookworm infection has been demonstrated in 93 of

Digitized by Google

the 100 counties in Virginia; in 99 of the 100 counties in North Carolina; in 140 of the 146 counties in Georgia; in every county in South Carolina; in 66 of the 67 counties in Alabama; in 77 of the 79 counties in Mississippi; in 27 of the 59 parishes in Louisiana; in 57 of the 75 counties in Arkansas; in 95 of the 96 counties in Tennessee; in 22 of the 119 counties in Kentucky." "In reference to the degree of infection, the survey had been completed on Dec. 31, 1911, for 78 counties in 9 States; Dr. Stiles states that the result shows an infection among the rural children from 6 to 18 years of age in these counties ranging in degree from 2.5 per cent to 90.2 per cent." As the campaign against hookworm disease in the United States progresses, the area of infection is being constantly enlarged by the discovery of new foci of infection. The disease is especially severe in the sandy coastal plains. Stiles has shown that more than 12 per cent of the cotton mill employees are infected, and the examination of recruits, college students and school children in different parts of the country gives a percentage of infection of from 20 to 80 per cent.

Climatology.

It may be stated that wherever the conditions of air, temperature, moisture and insanitation are suitable for the development of hookworm parasites the disease will be found.

Etiology.

The disease is caused by the presence in the body of *Agchylostoma duodenale* and *Necator americanus,* these two forms being peculiar to man, and will not mature in domestic animals, as do some other species of hookworm. The parasites live in the human body and subsist upon the materials extracted therefrom. The larvæ live in earth, and infection takes place by two routes, either through the skin or by the mouth. When infection occurs by the mouth it is usually due to eating infected vegetables, or as the result of the habit of geophagy. The full-grown parasites inhabit the upper part of the small intestines, and are also occasionally found living in the stomach. Having gained admission

Digitized by Google

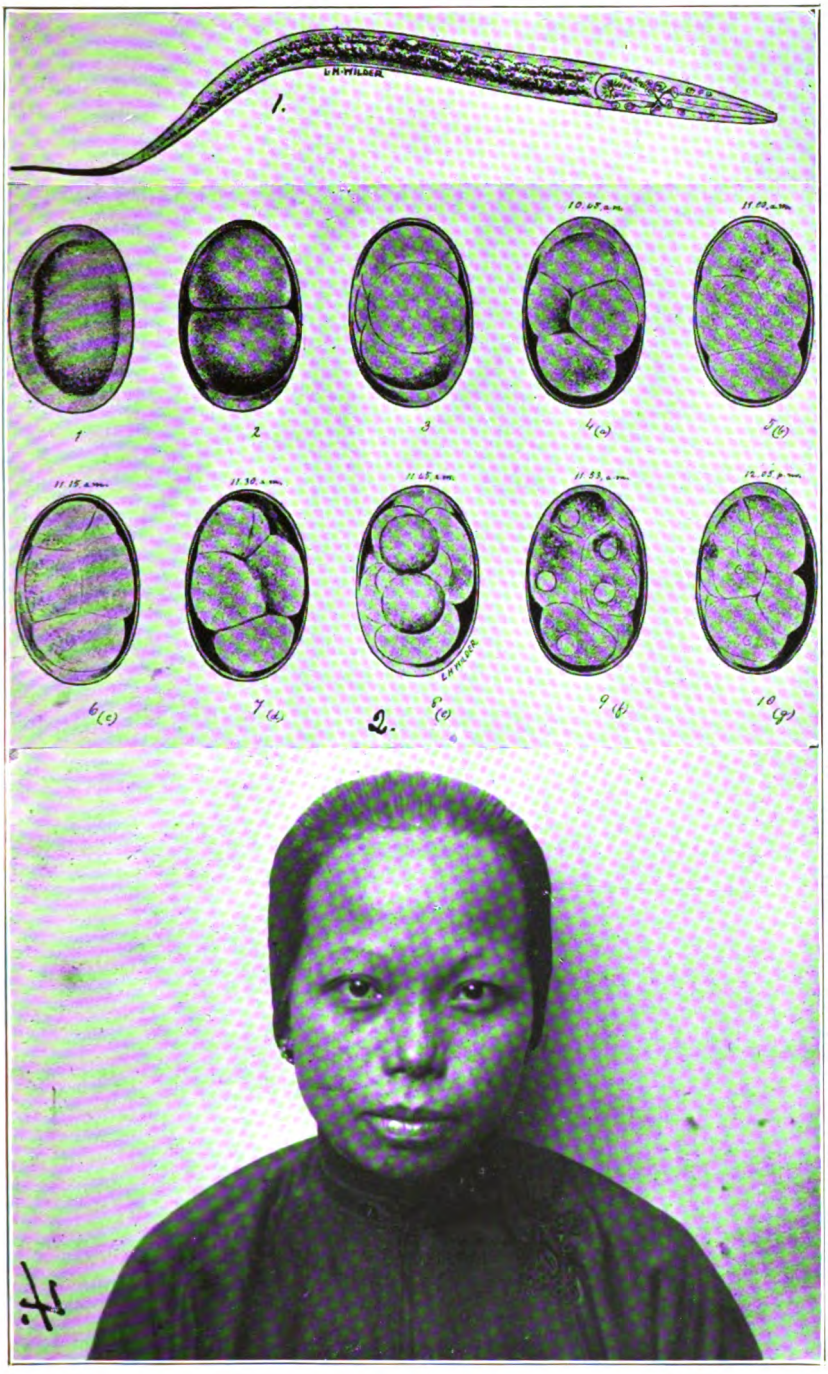
to the body by one of the two routes above mentioned, which will be described in detail under another heading, the worm attaches itself to the mucous membrane of the small intestine by means of minute hook-like teeth, and then proceeds to suck the blood and eat the epithelial lining of the gut. The pathological phenomena are probably mainly due to toxins liberated by the embryo, and inoculated into the blood stream of the host.

Morphology.

Agchylostoma duodenale.—The body is cylindrical, and tapers from back to front. It is flesh colored during life. It has a chitinous mouth which is terminal, carrying ventrally two pairs of hook-like teeth, and dorsally one pair. There is a single-celled head gland which runs through almost half the length of the body and opens close to the base of the outer ventral tooth. The floor of the mouth contains two ventral chitinous plates, and also the opening of the dorsal head gland. The male measures about 10 millimeters in length and from 0.4 to 0.5 millimeter in breadth, and possesses an umbrella-shaped bursa copulatrix at the posterior end, which is supported by chitinous rods. Through the opening of this bursa there project two long and slender spicules measuring about 2 millimeters in length. The generative apparatus of the male consists of a tubular testis, an oval vesicula seminalis, and a long cement gland the secretion of which serves to fix the male to the female during conjugation. The female measures from 12 to 13 millimeters in length, having the vulva at the junction of the middle and posterior parts of the body, from which a short vagina opens into two tubes, which are divisible into ovijector, uterus, receptaculum seminis, and an ovary.

Necator Americanus.—The body is cylindrical and attenuated anteriorly. The head is acutely bent dorsally. The mouth contains a pair of ventrally placed prominent semilunar chitinous plates, and a pair of dorsally placed slightly developed plates. The opening of the dorsal head gland projects into the floor of the mouth, having the appearance of a dorsal conical tooth, while deep in the cavity a pair of dorsal and a pair of ventral submedian lancets are seen. Behind the mouth is an excretory

Digitized by Google



FAUNTLEROY ANKYLOSTOMIASIS

Fig. 1. Greatly enlarged view of a hookworm shortly after it has hatched from the egg (after Stiles).

Fig. 2. Hookworm eggs, enormously enlarged in different stages of developments (after Stiles). The series a-g is drawn from one and the same specimen, at different intervals from 10:45 a. m. to 12:05 p. m., and shows how rapidly the development takes place. Original.

Digitized by Google

Fig. 4. A case of Ankylostomiasis: This woman was also heavily infected with ascaris lumbricoides and trichuris trichiuria. She showed none of the physical signs

Digitized by Google

pore with cervical papillæ on each side. The male is from 7 to 9 millimeters in length and 0.3 to 0.5 millimeters in breadth. The bursa consists of two large lateral lobes joined to a dorsal median lobe, which appears to be divided into two, and to an indistinct ventral lobe. Just posterior to the point where the bursa joins the body wall there is a slight ventral enlargement. The costa dorsalis divides at its base into two diverging bipartite branches. Briefly, the following peculiar anatomical characteristics may be noted: The *Agchylostoma duodenale* is larger and coarser looking, and its head is also thicker and larger than the *Necator americanus;* which is smaller than the Old World worm, and also having a small, finely tapering head. The buccal rim of the *Agchylostoma duodenale* is armed with four hooks, and has a dorsal conical tooth which does not project prominently into the mouth, whereas, the *Necator americanus* has simple chitinous lips on the buccal rim, and a dorsal conical tooth which projects well into the mouth. The female *Agchylostoma duodenale* has the sexual opening in the posterior third, whereas, the female *Necator americanus* has the sexual opening in the anterior half of the body. The male *Agchylostoma duodenale* possesses a large caudal bursa, with a dorsal lobe, whereas, the male *Necatur Americanus* has a small bursa, and a subdivided dorsal lobe. The ova of the *Agchylostoma duodenale* are slightly smaller than those of the *Necator americanus,* the former measuring from 32 to 40 micron. by 55 to 65 micron., the latter measuring 36 to 40 micron. by 67 to 75 micron. The ova of both species are oval, and exhibit a smooth, thin, transparent membranous shell. There is a clear space between the outer shell and the protoplasm, the latter being divided into 2, 4, 8 or more segments.

Life History.

The full grown hookworm (*Agchylostoma duodenale* or *Necator americanus*) inhabits mainly the upper part of the small intestine—the jejunum of the host—where they attach themselves by means of their hooklike teeth to the mucous membrane of the bowel and suck the blood and feed upon the epithelial lining. Very soon after having reached adult development in the small intestine, the worms mate, and the females commence to lay the

Digitized by Google

eggs, the description of which has been given elsewhere. During the progress of the egg through the intestines the granular protoplasm divides first into two, then into four segments, in which condition they are usually found in the feces, although it is by no means uncommon to find the ova having eight segments. Full development of the ova does not occur until after they are discharged with the feces of the infected host. The development of the egg in the feces progresses in rapidity according to the conditions of heat and moisture, ranging from eight hours to several days. Under favorable conditions of air, heat and moisture, there will appear in each egg, in about 24 hours, a minute embryo coiled up inside the shell. The embryo soon ruptures the surrounding shell, becoming a larva, and feeds upon the feces. It first sheds its skin in the course of two or more days, but continues to feed upon the filth. The embryo again sheds its skin in about a week, but continues to live inside of the skin. At this stage of development the worm ceases to eat, living on the food material enclosed in its own cells. The worm can remain in this condition (stage of encystment) unchanged for months, and during this stage it may manifest considerable activity as swimming, or climbing up any wet surface. This is a factor of considerable importance in explaining the production of certain skin eruptions. The worm is now capable of infecting man, which it does through the hair follicles, producing eruptions or sores, a condition variously known as "ground itch," "dew poison," etc.

The young worm may also enter the host by way of the mouth on various articles of food or drink, principally the uncooked foods. From the hair follicles it works its way into the superficial venous blood vessels and lymphatics. When infection takes place into the venous blood vessels, the worm is carried to the right heart and the lungs. When infection occurs by way of the lymphatics many of the parasites are destroyed in the lymphatic glands, but some escape destruction and eventually reach the lungs. Having arrived in the lungs the young worms work their way out of the capillaries into the lumen of the pulmonary air cells, and from there they travel up the bronchial tubes, trachea and larynx into the esophagus, and from

Digitized by Google

thence through the stomach and duodenum to the jejunum. The time required for the young worms to make this journey is believed to be from 7 to 10 days. Upon arrival in the intestine "the worm sheds its skin two more times, becomes adult and mates." The eggs may appear in the stools 6 or 7 weeks after skin infection. Sambon proved that the young parasites, after reaching the lungs, may pass from the pulmonary artery to the pulmonary veins, thus reaching the general blood stream, and in time arriving in the lumen of the jejunum after having pierced its mucosa. It is believed that the larger number of parasites follow the route (Looss's) first described, and this is, therefore, more important than the route (Sambon's) last described.

As regards the viability of hookworm infection, Stiles reports the following results of his experiments conducted at Wilmington, N. C.:

(1) "It is not safe at present to assume that the sand under and around a privy is entirely free from hookworm infection for about five months (151 days) after the privy was last used."

(2) "After about four months (120 days), however, the infection may be very greatly reduced, and possibly in some instances entirely killed."

(3) "After about five months (150 days) in sand, live Ascaris embryos in the eggs may be found, even when all hookworm larvæ observed are dead. Ascaris eggs, apparently alive and normal, were found after 156 days."

(4) "Hookworm eggs may be identified in sand cultures 117 days old."

(5) "When fecal material is subjected to decomposition in water for seventy days (namely, about 2 1-3 months) the mass of hookworm eggs die, but a few can survive."

(6) "No hookworm egg has as yet been found alive in feces subjected to decomposition for 117 to 149 days, namely, about four to five months."

(7) "It is very probable from present data that, under conditions under which the above observations were conducted, if fecal material containing hookworm eggs is subjected to decomposition in water for about three months all hookworm infection will be dead. If this probability is confirmed by further observations, then, viewed from the standpoint of hookworm infection alone, the effluent from the L. R. S. sanitary privy, described in Public Health Reports, 1910, pages 1619-1623, should be stored three months before being used as fertilizer."

(8) "In feces allowed to decompose in water, Ascaris eggs resist the decomposition better than do the hookworm ova. At the end of about four months (117 to 121 days), however, at least 80 per cent of the Ascaris eggs appear to be dead."

Digitized by Google

(9) "The action of chloride of lime in the strength of approximately one-fourth pound to 10 1-2 quarts of water for 22 to 40 hours does not kill hookworm eggs."

Pathology and Morbid Anatomy.

The entrance of the embryos into the skin usually gives rise to an eruption of papules or vesicles. These skin lesions are variously known as "ground itch," "mazamorra," etc., and it is probable that a considerable number of the lesions are due to the pus producing micro-organisms, which enter the skin along with the hookworm larvæ. However, Smith has proved that experimental infection with the worm alone is followed by the appearance of a macular eruption, which is followed by vesicles, and the affected part itches and becomes swollen, the lymph glands also becoming enlarged. This dermatitis disappears within twelve days.

The effect produced by the parasites upon the blood and organs of the host becomes very marked in time and is often out of proportion to the number of worms that can be found in the intestine. That the parasite, while in the body, produces a substance which inhibits the coagulation of the blood, is now quite generally accepted. Intestinal putrefaction appears to exist to a marked degree in hookworm disease. The cause of the anemia may possibly be due to hemolytic toxins produced by the worm, and loss of blood due to the bites of the worms, and to secondary microbic infections.

Post-mortem an eruption may be found about the feet, and the ankles may be edematous. The visible mucous membranes have a dead-white or chalky white appearance. Upon opening the abdomen the tissues are found to be pale and moist; the peritoneum is sodden; the intestines very pale; a straw colored fluid may be found in the peritoneum; the liver shows parenchymatous and fatty degeneration; the kidneys may be enlarged, pale and fatty; the spleen is usually shrunken; the stomach exhibits the changes incident to chronic gastritis; the pancreas and suprarenals are usually normal; the mucosa of the jejunum shows small hemorrhagic points, indicating the location of the bites, and the mucosa may have a dark red color.

Digitized by Google

Large numbers of worms may be found in the jejunum, or they may be conspicuous by their apparent absence. Sandwith found 1,353 out of 1,524 worms in the first six feet of the bowel. Rarely the worms will be found in the stomach. Whipple has found the worms in the blood cysts which are occasionally formed in the sub-mucosa.

In the chest the lungs may be found to be more or less edematous; the heart pale, fatty and perhaps enlarged.

Symptomatology.

General Features.—The symptoms common in cases of severe hookworm infection will be described. Inasmuch as the disease presents a very variable picture according to the severity of the infection, the length of time the infection has existed, and the amount of resistance shown by the patient towards the infection, it is manifestly impracticable to designate a list of symptoms as being characteristic of all cases of hookworm disease. The intensity of the symptoms are found to vary from the pronounced clinical picture of the disease observed in the dirt eater, to cases in which subjective symptoms are entirely wanting, and the existence of the infection is not suspected until the accidental discovery of the ova in the stools of the patient. It is also unwise to form an opinion as to the number of worms present in a given case, which is based upon the severity of the symptoms manifested by the patient; because fatal cases have been observed where only ten or twelve worms were found, while recovery has been known to occur after more than 4,000 worms have been expelled (Dock). Hookworm disease is the cause of a widespread degeneration and delayed development in the personnel of badly infected communities. When the disease is acquired prior to puberty, development, both physical and mental, is retarded, such persons having the appearance of being considerably younger than they really are because of the evident lack of development. Anemia, more or less marked, is a prominent symptom, and such cases usually show the circulatory and respiratory symptoms of anemia. An apathy and lack of energy are very commonly associated with hookworm disease, so that in some sections of the country the condition

Digitized by Google

has received the name of "lazy disease." Many persons who harbor hookworm infection continue to attend to their daily affairs, and to all appearances are enjoying good health. However, if a careful inquiry be made as to the general health of such persons, extending over a period of several months, it will be found that in the majority of cases there will be a history of a considerable amount of the minor illnesses and more or less physical incapacity. In women sterility and delayed menstruation are commonly met with. Many persons complain of epigastric discomfort or pain. There may be anorexia and a craving for unusual articles of food, and even geophagy. Stiles mentions the case of a boy who ate three coats, thread by thread, in one year's time. As a rule the habit of geophagy will be denied. Constipation is exceedingly common, but diarrhea occurs once in a while.

Local Features.—"Ground itch" is the local lesion usually found upon the feet or hands, very commonly between and beneath the toes, through which the parasites enter the body. There is an eruption of vesicles followed by pustules and a sticky exudate. The adjacent skin becomes red and swollen. The dermatitis usually subsides within twelve days, the vesicles and pustules becoming dry and are exfoliated.

Physical Signs: Inspection.—The patient, as a rule, has the appearance of being under-developed both mentally and physically, if infection has occurred before puberty. The face often presents an anxious, stupid expression. The hair of the head is dry, and the beard, axillary and pubic hairs may be scanty, The eyes often have a "dull, blank, almost fish-like or cadaveric stare," which is very characteristic. The pupils are usually dilated. The conjunctiva has a chalky white appearance. There are dark rings under the eyes, and edema more or less pronounced is sometimes observed over the cheek bones. The tongue may show purplish smears, one on each side of the median line. Night blindness has been observed. The skin has a waxy white or dirty yellow color, resembling tallow, being especially marked on the forehead and alae of the nose. Cervical pulsation is often very noticeable at a distance of several feet. There may be no line of demarcation between the lips and skin. The muscles of the thorax

Digitized by Google

are wasted and the ribs and shoulder blades are prominent. The shoulders are bent forward and droop. When ascites is marked the abdomen is prominent, resembling to some extent a person suffering from malarial cachexia or Kala-azar. The scrotum, legs and feet may be edematous. Scars of old tibial ulcers are occasionally observed, and the lesions of "ground itch" may be seen about the feet.

Palpation.—The hair feels dry and the skin is often unnaturally dry. Owing to the emaciation of the thorax it is sometimes possible to sink the hand below the median margin of the scapulæ. The apex beat of the heart will sometimes be located below and to the outer side of the nipple, and there will be more or less diffuse pulsation over the cardiac area. The heart's action is accelerated, and the pulse is rapid and of low tension. There is often extreme sensitiveness to pressure in the epigastric region, the weight of the hand being sufficient to make the patient complain.

Percussion.—The percussion note may be perfectly normal over the lungs. The area of cardiac dullness is often enlarged downward and to the left. The liver is often enlarged especially in children. The stomach is quite frequently enlarged.

Auscultation.—In cases of moderate severity with cardiac hypertrophy, murmurs are heard in the third intercostal space, and in the axilla. Hemic murmurs are very frequently heard.

Blood.—There is marked anemia which has been shown by Boycott and Haldane to be due to a hydremia—the total volume of the blood being increased, without a corresponding increase in the cellular elements and hemoglobin. One of the first pathological signs in the blood is a diminution of the color-index. In some cases the red cells, in addition to showing a marked decrease in number, will exhibit various pathological changes, for example: Poikilocytosis, polychromasia, normoblasts, megalocytes, and megaloblasts are observed. It has been shown that the principal leucocytic changes occur in the blood before the anemia becomes marked, the leucocyte counts at this stage often running very high, and the eosinophiles being greatly increased. The hemoglobin at this stage shows but slight reduction, ranging from 98 to 80 per cent. The onset of the anemia, unless very

Digitized by Google

rapid, is marked by a fall in the leucocyte counts. In extremely anemic cases there may be a leucopenia. These peculiar leucocytic changes are thought to be mainly due to exhaustion of the bone-marrow brought about by the anemia. The eosinophilia remains after the feces are free of the hookworm ova. The normal structure of the leucocytes remains unaltered. It is probable that the eosinophilia and the lack of proper formation of the hemoglobin are due to the action of toxins. However, severe cases of hookworm disease have been observed in which there was no eosinophilia. Eosinophilia is apt to be more marked in children. The diminution in the production of hemoglobin brings about a lowering of the amount of iron contained in the liver.

Urine.—The urine is often copious, pale and alkaline, with a specific gravity ranging from 1010 to 1015. Albuminuria is not often observed, but the indigo blue and urobilin are increased. The excretion of nitrogen is said to be greatly increased. It is thought by some (Lussana) that the urine contains toxins which when separated and injected into animals produces a diminution of the red cells, loss of hemoglobin and poikilocytosis.

Feces.—The color of the feces varies considerably. The occurrence of blood in the feces appears to be the exception rather than the rule, but it is probable that with the improved technique of detecting blood in the feces, it will be found to be present in a much higher percentage of cases.

Temperature.—The temperature varies from subnormal to about 102 F. Three types of fever have been observed, as follows: a low intermittent type, an irregular type, and an undulating type.

Diagnosis.

A positive diagnosis of hookworm disease can be made by two methods, namely: (1) by finding the ova by microscopic examination of the feces, and (2) by finding the worms expelled in the stools after treatment. A third method of diagnosing the disease by means of a study of the clinical phenomena, although of considerable value to the expert, should not be relied upon to the exclusion of the methods above mentioned.

Digitized by Google

Fig. 3. Temperature chart of a case of Ankylostomiasis.

Digitized by Google

Microscopic Examination of Feces.—In making microscopic examinations of feces for the hookworm ova, it should be remembered that the ova may be very few in number and difficult to find at the first examination, and may have to be searched for on several days. The eggs may often be made to appear in considerable numbers by giving an aperient.

The technique commonly employed in preparing specimens for microscopic examination is to collect a small quantity of the feces upon a platinum loop or toothpick and thoroughly mix it with a drop or two of water on a slide, then cover the mixture with a cover glass. The specimens thus prepared are examined under the low power of the microscope. In heavy infections the ova may be found in the first preparation, but an expression of opinion should be withheld until a number of such preparations have been carefully examined. If the fecal material is fresh the eggs will usually be found to have 4 or 8 segments, but the presence of ova showing 32 segments would suggest the presence of another parasite. When free embryos are present in fresh feces it is probable that the worm *Strongyloides stercoralis* is present. To facilitate the search for the eggs in feces several special methods ahve been used, as follows:

Special Technique—Penner's Method.—Consists of first diluting the feces with a considerable amount of water then centrifugalizing it in small quantities. The centrifugalization is frequently repeated, the supernatant water being poured off each time and replaced by clean water. This process is continued until all the light vegetable matter, coloring matter, etc., is removed, leaving only the heavier material with which the ova will remain. An examination of this frequently washed sediment under the low power of the microscope will often show numerous eggs. Taking advantage of the quality possessed by hookworm ova of sticking to the slide more tenaciously than the other fecal material, it is possible to prepare a slide thickly studded with the ova by the repeated addition of drops of the washed sediment, followed by carefully immersing the slide in water so as to wash away the undesirable material.

Bass's Method.—The following description of Bass's technique is given in Public Health Bulletin No. 32: The specific gravity of

Digitized by Google

fresh uncinaria eggs is between 1,050 and 1,100. When they grow old this is increased in many specimens. A quantity of feces is well diluted with water, 1 in 10, and strained through gauze to get rid of coarse particles. This is centrifugalized, the fluid poured off, the centrifuge tube refilled and centrifugalized again until all the diluted feces have been used. The precipitate is rewashed several times with water as long as anything can be washed out. To know just how long to continue the centrifugalization is the secret of success. One must learn just what is the proper time for his centrifuge. It should be carried out at high speed and just long enough to throw the eggs to the bottom. Too long centrifugalization defeats the purpose. With a centrifuge running 3,500 revolutions per minute, ten seconds at first, when there is much matter, and then four to five seconds is usually the proper time. The centrifuge must be steady. This gets rid of most very small things, those having flat, rough surfaces and those having a specific gravity about that of water. Now the precipitate should be washed as before, using calcium chlorid solution of a specific gravity up to 1,050 (calcium chlorid is preferable to other salts because of its hygroscopic property. This was suggested by Prof. A. L. Metz). This disposes of everything having a specific gravity below 1,050, and the precipitate may now be examined. There frequently remains a considerable amount of material, much of which is considerably heavier than the eggs and of such a character that it interferes much with their recognition. This material may be removed by centrifugalizing with a solution sufficiently heavier than the eggs. A solution with a specific gravity of 1,250 is very satisfactory. In such a solution the eggs go to the top and other material below. With an appropriate pipette one may remove a few drops from the surface and examine, or, what is still better, pour off some of the top fluid containing eggs, dilute with water sufficiently to bring the specific gravity below 1,050 and centrifuge again. The precipitate will now contain most of the eggs contained in the original amount of feces and may all be put on one slide and examined. One such slide contains as many eggs as could be found in several hundred ordinary slide preparations of feces.

Digitized by Google

Telemann's Method.—This method consists of shaking together a small portion of feces with equal parts of ether and hydrochloric acid, filtering the mixture, and then after centrifugalizing the filtrate examine the bottom deposit under the microscope.

Diagnosis Based Upon the Search for Worms in the Feces After Treatment.—The patient is instructed to strain all the stools passed on the day when the thymol is given, and also the following day, using a cheese cloth as a strainer, which is to be kept moist, and delivered for examination at the end of the second day. If worms are passed they will be found in the cheese cloth. So long as worms are found after treatment, the treatment is continued. In cases of light infection, unless the patient is very careful in carrying out the above process, the few worms that are expelled after treatment may escape detection, and a positive diagnosis would thus be prevented. Another method of examining the feces for the worms which is quite satisfactory, is to mix the fecal material with water, allow it to settle and then decant the supernatant water. This process is continued several times, after which the washed deposit is transferred to a shallow dish having a black background, and the little whitish or grayish worms looked for.

Diagnosis Based Upon Symptoms.—Stiles says: "Given a patient in the area of infection, with dry hair, dry skin, dilated pupil or with unusual tendency to dilatation, with tenderness in the epigastric region, continuing toward the right, but with a tendency to disappear toward the left, with winged shoulders sloping down and forward, slow speech, tallow-like skin, poorly-developed in general, anemia, scant pubic and axillary hair, a delayed type of menstruation, and a history of ground itch, especially if several such persons exist in the same family, and the diagnosis is practically positive."

Pronounced cases of hookworm disease may be recognized by observing the symptomatology, but the disease presents a very variable picture, and unless one is thoroughly familiar with the condition in all its phases, a diagnosis based upon the symptoms alone is little more than a guess and never a certainty. A microscopic examination of the patient's feces should be made in all cases if practicable, and the treatment deferred until the

Digitized by Google

ova are found. In the examination of Orientals for the disease, the writer has repeatedly found the ova in the feces of persons who showed none of the physical signs of the disease.

Diagnostic Blood Changes.—In the majority of cases the percentage of hemoglobin will be markedly reduced before the red cells have undergone much change. In advanced cases the red cells may be reduced to less than a million per cubic millimeter of blood. The early diminution of the color-index is a valuable sign. A well-marked leucocytosis is very apt to be observed early in the disease before the anemia becomes pronounced. Eosinophilia is also a valuable early sign. Boycott and Haldane found that 94 per cent of infected persons had over 8 per cent of eosinophiles.

Prognosis.

A person who harbors hookworm infection may possibly remain more or less infected for a period of ten or twelve years, excluding any reinfection. Hookworm disease is responsible, directly and indirectly, for an enormous number of deaths, illnesses and incapacity among the poorer classes in heavily infected areas. It is probable that a large number of the deaths certified as due to anemia, dropsy and malaria in some hookworm infected areas, are in reality due to unrecognized hookworm disease.

Treatment.

Destruction and Removal of the Parasites: Preparation of the Patient.—Prior to beginning the attack upon the worms in the intestine, the patient should be carefully examined as to the condition of his organs, and if practicable the degree of anemia accurately determined, as the drug (Thymol) which is usually employed to kill and expel the worms is decidedly dangerous in cases presenting diseased organs, and extreme anemia.

The patient should be allowed only a very light diet for a day or two preceding the treatment, and a dose of magnesium sulphate should be given the evening before with a view to uncovering the worms by washing out the undigested food, mucus, etc., so that the anthelmintic can have access to the worms. Thymol

Digitized by Google

is the most efficient drug to use, and in the absence of contrary indications, is given in 4 gram doses to adults, in capsules or cachets, this dose being divided in half and administered in 2 gram doses with an interval of about two hours between doses. The usual plan of treatment is to give one-half of the entire dose at 6 a. m. and the other half at 8 a. m., followed by a dose of magnesium sulphate at 10 a. m. No food must be given until 11 a. m., when a cup of tea without milk, or a little broth may be permitted. Under no circumstances should any alcohol, oils, fats or milk be allowed while the thymol is being taken. Immediately upon taking the thymol the patient should lie down upon the right side so as to encourage the thymol to enter the intestine as speedily as possible, and it is advisable to keep the patient in the recumbent posture until at least one-half hour after the last dose of thymol has been given. Castor oil should never be given after the thymol. In determining the amount of thymol to be administered in a given case, due consideration should be given to the result of the physical examination which should always precede the commencement of the treatment, and if the patient has the general appearance of under-development, a severe anemia or organic disease, the dose of thymol should be regulated accordingly. It is important that the bowels should act vigorously within four hours after the last dose of thymol, and if delayed much beyond this time another dose of magnesium sulphate should be given.

Repetition and Duration of Thymol Treatment.—The treatment outlined above may be repeated once or twice a week if necessary, and continued until the ova can no longer be found in the feces on repeated microscopic examination after two or three weeks. The detention of the patient for a period of two or three weeks, in order to determine by repeated microscopic examination of the feces whether a cure has been effected, may appear to be excessive and unnecessary, but the writer has found by experience that it is not advisable to pronounce a case as "cured" after an examination of a number of negative specimens prepared from the stools during the first three or four days after the treatment. The writer has under observation at the present time several cases of hookworm infection which have shown no

Digitized by Google

ova in their feces for the first four to eight days, but the ova were found after this time had elapsed since the treatment. It is presumed, in explanation of the foregoing experience, that the action of the thymol had failed to kill all the worms in the intestine, and that the remaining worms were so affected by the treatment that the production of eggs was temporarily inhibited.

Action and Therapeutics of Thymol.—Thymol in its effects resembles phenol, though it causes less stimulation of the central nervous system, and is more slowly absorbed, less irritant, and less poisonous to the higher animals and man. Thymol is an antiseptic, having an inhibiting influence on fermentation and putrefaction. A persistent acrid sensation in the fauces is caused by thymol. Although it rarely produces vomiting, large doses cause a feeling of warmth about the epigastrium, and quite frequently diarrhea. Profuse sweating is apt to occur in from half an hour to an hour. Thymol causes a reduction of the body temperature. Convulsions and tremors are rarely induced in either frogs or mammals, and under toxic quantities the animal, after a stage of gradually increasing weakness and apathy, generally sinks into fatal collapse. Thymol has an irritant action upon the kidneys, and under its use the urine may contain blood, as well as albumen. The urinary secretion is sometimes increased, and is of a dark greenish hue, due to the presence of a green coloring substance. This becomes blue on the addition of acid, and is thought to be nearly related to but not identical with indigo. Thymol is excreted in the urine in combination with sulphuric and glycuronic acids, partly unchanged and partly oxidized to thymol-hydroquinone. In large doses thymol is an efficient anthelmintic for the *Agchylostoma duodenale*. On account of the danger of toxic effects, the patient should be warned not to take any solvent of thymol, such as alcohol, oils, fats, etc., after the administration of the remedy. Thymol is very insoluble in cold water—only 1 in 1,500, but it is easily soluble in alcohol, ether, chloroform, glycerin and turpentine.

Other Anthelmintics: Eucalyptus Oil and Chloroform.—A mixture of these two substances is recommended for children and debilitated adults. However, it does not work as satisfactorily as thymol, but is safer and can be repeated several days

Digitized by Google

in succession. The chloroform is probably the active constituent of the mixture. The formula usually employed is as follows:

Olei eucalypti	30 minims
Chloroformis	15 minims
Olei Ricini	10 drams

One-half of this mixture is to be given early in the morning and the other half given about one-half hour after the first dose. The bowels should be cleaned out the evening before by a saline.

Betanaphthol.—Is given in 15 to 20 grain doses put up in capsules or in cachets like the thymol. The patients often complain of severe burning in the stomach after taking this drug, and it should not be given to persons suffering from diseases of the kidneys. The results obtained with the drug are not entirely satisfactory.

Treatment of the Skin Lesions.—The area showing the eruption ("ground itch") should be thoroughly cleansed with green soap and water, and then dressed with a lotion of carbolic acid 1 in 100 to 1 in 50, or a carbolized salve may be applied. The infected area should be bandaged and the patient required to wear shoes and stockings.

Treatment of the Anemia.—Upon completion of the thymol or other treatment for the destruction of the parasites, it is advisable to begin the administration of some good preparation of iron, as the syrup of the iodide, or Blaud's pills, care being taken to keep the bowels active while giving the iron, which has a tendency to produce constipation.

Economic Significance and Effect on Education and Civilization.

Hookworm disease is the cause of an enormous economic loss. A healthy coffee picker in Porto Rico is said to pick from 500 to 600 measures of coffee per day, but a coffee-picker who has hookworm disease will rarely be found to average 50 per cent of the amount picked by a healthy person. It is admitted that

Digitized by Google

the disease has reduced the average efficiency of the labor on the plantations in Porto Rico to from 35 to 50 per cent. In French Guiana it is reported that the disease has greatly retarded the development of the country. In British Guiana it is reported that the economic loss due to the disease on the sugar estates is heavy. On one estate the working power of the gangs was increased 100 per cent as the result of the treatment of the disease in the laborers. In Colombia, where the infection is very heavy in the lowlands, the evil effects of the disease is one of the most serious problems concerning the welfare of its people. In Ceylon it is reported that the loss of labor caused by the prevalence of hookworm disease is very serious, there being serious loss of life, due either directly or indirectly to the disease, and many of the laborers are rendered invalids and paupers. In the United States, in the South Atlantic and Gulf States, containing about 20,000,000 of people, the degree of infection is very heavy, and the general efficiency of the laboring classes is markedly impaired. It is estimated that in this section of our country the loss of money by reason of the direct and indirect effects of hookworm disease will reach several millions of dollars per annum; aside from the loss to the country in the degenerating effects produced by the disease, and the consequent delayed development of the various industries throughout this section of the country. Stiles has shown that more than 12 per cent of cottonmill employees in the Southern States are infected. The loss to this industry alone must be great, because of the incapacitating effects of the disease. In the mines of California the general efficiency of the workers is noticeably impaired, many of the men being compelled to discontinue their work because of the disease. A loss of 20 per cent in efficiency in those infected is considered a conservative estimate. Nearly all of the gold mines of California contain the infection, as well as a goodly number of the agricultural laborers of the state, so that this one state must suffer a great loss in various ways by reason of the disease.

In the infected communities it is common to find whole families showing a marked degree of illiteracy which is traceable to the disabling effects of the disease, and in many instances it is learned that for several generations none of these people

Digitized by Google

have so much as entered a school. A proper appreciation by the general public of the incalculable importance of this disease in all its manifold bearings upon the welfare of the nation is certainly urgently needed. Hookworm disease bequeaths a pernicious legacy to the infected communities, its work being done in a subtle, insidious manner, weakening the race generation after generation, always tending to produce a condition of physical, intellectual, economic and moral degeneracy.

Epidemiology.

Geographic and Topographic Distribution.—Hookworm infection extends around the world. Although the geographical limits of the infection are not sharply defined, the disease is mainly confined to the tropical and sub-tropical countries. Scarcely a single tropical country is free from the infection. In Europe the disease is found mainly in the mining districts, but in many countries the infection is general and widespread. In the United States the infected areas are found principally in the South Atlantic and Gulf States. The occurrence of any considerable number of cases much farther north than the Ohio and Potomac Rivers is in the majority of instances accounted for by the presence of a large foreign element in the population of the community, or the disease was introduced by persons coming from some part of the country where the disease is prevalent. The disease is more commonly found in the areas having a porous soil, sandy areas near the coast being more severely infected.

Meteorologic and Telluric Conditions. — Hookworm infection thrives in the warm, moist climate of the tropics. In the regions having a cold climate the disease is not generally prevalent, being almost wholly confined to the mine and tunnel workers. Direct sunlight has an inhibitory influence upon the development of the ova, but much shade is a favorable condition. Complete dessication destroys the eggs. The ova are occasionally found to show considerable resistance to unfavorable influences, and they may survive freezing followed by a gentle thawing.

Social and Hygienic Conditions.—The disease prevails mainly among persons in poor financial condition, who live in insanitary

Digitized by Google

surroundings in regions favorable to the growth and development of the parasite. But the better classes are by no means exempt from the infection, although the disease is much less common and not so severe as in the poorer classes. Over 30 per cent of the students in some colleges, and from 35 to 95 per cent of the pupils in some country schools are known to harbor the infection. Stiles states that as the result of a sanitary survey of 43,448 rural homes there were found 21,308 homes that had no privy at all. When the influence of soil pollution upon the spread of hookworm infection is appreciated, it is readily understood why the disease prevails so extensively in the rural districts. The ignorance and indifference as regards sanitary matters, made so manifest in the rural communities, is responsible for the widespread distribution of not only hookworm disease, but many other preventible diseases. In cities having adequate sewage systems the disease is infrequent because of the lack of soil pollution.

Incidence Among the Population.—In the infected communities the total number of cases is usually large, depending in degree upon the social, financial, educational, soil and climatic, and sanitary conditions which prevail. Stiles estimates that at lease 30 per cent of the rural inhabitants of our Southern States have hookworm infection, and in some restricted localities fully 90 per cent are afflicted. The following brief statement is given to show the incidence among the population of some foreign countries, the percentages given being based mainly upon the prevalence of the disease among various laboring classes: Porto Rico, 90 per cent; Colombia, 90 per cent; British Guiana, 50 per cent; Dutch Guiana, 94 per cent; French Guiana, 35 to 88 per cent; Egypt, 50 per cent; Ceylon, 90 per cent; India, 60 to 80 per cent; Malay States, 47 to 74 per cent; Chinese Republic, 70 to 76 per cent.

Influence of Food and Water Upon the Spread of the Disease.—Hookworm infection may be acquired by eating contaminated vegetables which are commonly eaten in an uncooked condition. In some localities the farmers utilize the fresh night soil for the purpose of fertilizing their vegetable gardens, the fresh fecal material being much diluted with water or earth and then dis-

Digitized by Google

tributed over the gardens. This extremely filthy practice is not only productive of hookworm disease, but is sometimes the cause of widespread epidemics of such diseases as typhoid fever, dysentery, etc., causing many deaths and great expense in the affected community. The drinking water used in the mines of an infected area sometimes becomes a disseminating agent because of the ignorance and carelessness shown by the laborers in matters of personal cleanliness and decency.

Age, Sex and Race Incidence.—In some mining districts the disease may prevail more extensively among the adult population. Stiles is, however, inclined to discredit the assumption that the disease is generally more common in adults than in the young, stating that it is "distinctly at variance with his experience in the United States," as is shown by the following table:

Over 20 years old	272 suspects,	18.5 per cent of 1,470
Bet. 16 and 20 years old	338 suspects,	22.9 per cent of 1,470
Under 16 years old	860 suspects,	58.5 per cent of 1,470

As regards the sex incidence, it may also be stated that in the mining districts more males than females may be infected. In other words, the relative incidence in the two sexes may be expected to vary according to the local conditions. In the examination of 1,725 cases and suspects, Stiles found that the percentage of infection was greater among the females. In the examination of Oriental aliens the writer has had a similar experience, namely, a greater incidence among the females. With regard to race, it is a peculiar fact that whereas the negroes and Filipinos are often found to harbor the infection, they are frequently found to be remarkably free from severe symptoms.

Influence of Immigration.—There is abundant evidence to prove that a great deal of the infection in the United States and its possessions is directly traceable to its alien population who in years past brought from their native lands a heavy stream of hookworm infection. Going back to the early history of the disease in the United States, it is believed that the negro slave trade was responsible for the introduction of the infection. Sev-

Digitized by Google

eral years ago the health authorities at San Francisco examined a ship load of Indian coolies and found them to be infected to the extent of about 90 per cent. It is said that "every group of Indian coolies now (1911) in California is a center from which the infection is spreading in that state." Those countries importing coolie laborers from India are admitting the infection in every 6 or 8 out of every 10 persons allowed to land. The importation of coolie labor is regarded as the source of hookworm infection in British Guiana. Of the 16,000 Indian coolies in Jamaica, about 50 per cent are said to be infected. The Indian coolies have carried the disease from India into Dutch Guiana, Ceylon, Federated Malay States, Straits Settlements and Java. Hookworm disease is classed as a "dangerous contagious disease" in the Immigration Laws of the United States, and the deportation of infected aliens is mandatory under the law. Thus a valuable means is made available, the practical application of which is of great importance in holding in check the entrance and spread of the infection by means of our alien population. Hundreds of infected aliens seek admission to the country each year, but through the viligance of our national health authorities stationed at the various ports of entry, the disease is promptly detected and such persons are refused admission until cured of their infection.

Influence of Carriers.—In hookworm disease as in many other diseases an important factor in the dissemination of the infection is the number of individuals who have the disease in so mild a form that little or no inconvenience is felt. Such persons mingle freely with other persons in the community, and to all appearances are in good health. Inasmuch as they are usually entirely ignorant of their condition, no action whatever is taken to eradicate the infection from their systems, and they continue to act as distributing agents of the infection. The amount of hookworm infection that will be disseminated through the agency of these mild, unrecognized cases, will depend largely upon the prevailing hygienic and sanitary conditions. In the rural districts where a sanitary privy is rarely seen, or where there are no privies at all, as is frequently the case, the influence of the carrier in spreading the infection throughout the community is

Digitized by Google

very important. Under these conditions the infected persons deposit their feces on the ground in any place that happens to be convenient, and with every movement of their bowels thousands of hookworm eggs escape to infect the soil, and after reaching a certain stage of development in the soil they are ready to return to the human host.

Influence of Soil Pollution and the Privy.—The most essential factor in the spread of the disease is the pollution of the soil by the fecal discharges of infected persons. The prevention of soil pollution by hookworm infected persons means eradication of the disease, and a marked improvement in the general health and prosperity of the community. Inasmuch as there is an abundance of indisputable evidence to show that this disease, and many other parasitic diseases, are spread broadcast over the country by soil pollution, causing many deaths, much sickness, poverty and expense in the affected communities, there should be strict compulsory laws prohibiting pollution, and any failure to comply therewith should be punishable by heavy fines and imprisonment. In many rural districts the sanitary conditions which obtain with respect to the disposal of human excreta is, from a sanitary standpoint, not one whit better than the dumb animals in the community. The deposition of all human excreta in sanitary privies, and the proper disposal thereof, is the sanitary reform most urgently needed in the infected districts. All fresh human fecal material should be regarded as a virulent poison and disposed of accordingly.

The hookworm ova are discharged mixed with the feces of the infected persons, many thousands escaping from a single person in the course of twenty-four hours, as a rule. Under favorable conditions the eggs develop into worms, some of which are almost certain to find their way back to the human post. This process goes on and on from person to person until a widespread infection results. When we realize the extent of the ignorance and carelessness which is displayed in some rural communities of our Southern States in regard to sanitary matters, it is little wonder that hookworm disease is an exceedingly common disease. As previously stated elsewhere in this article, Stiles found 21,308 rural homes that had no privy at all. An estimate of more than

Digitized by Google

2,000,000 cases of infection in the United States is probably not an exaggeration.

Public Measures for the Control of Hookworm Disease.

Organization of the Public Health Forces.—In times of war a factor of considerable importance having a bearing upon the probable outcome of the campaign, is the degree of perfection attained in the organization and training of the opposing forces. Likewise, in a campaign having for its object the eradication of a widespread disease like hookworm disease, the ultimate success of the undertaking will depend largely upon the character of the organization. The following are some of the essential qualifications of a health officer: He should, if possible, be a specialist in public health work; he should be a prominent and respected person in the community; he should have a high standing among his colleagues in the profession; he should devote his entire time and energy in the performance of the important duties of his office, and he should be liberally paid for his services; he should be independent of any political restrictions and influences which would interfere in the slightest degree with the efficient performance of public health work; he should be backed by ample public health laws and see that they are properly enforced; he should have access to adequate funds with which to meet the expenses of his office; he should have at his disposal a properly equipped laboratory for diagnostic purposes, and he should have a sufficient number of assistants to carry on the details of the work under his direction.

The Citizen's Part in the Public Health Campaign.—The citizen can do much to secure good health conditions for himself and his neighbor. He should acquaint himself with the reasons and the necessity for the various public health activities, and he should insist upon the proper instruction of his children in the care of their bodies. He should use his vote and all the personal influence at his command to secure an efficient public health service for the community, and having secured it he should give it his active support and every possible encouragement.

Sanitary Survey of Infected Localities.—The public health

Digitized by Google

forces should conduct a systematic survey of the infected localities with a view to accurately determine the degree of infection, the sanitary conditions which obtain as to soil pollution, and other data influencing the prevalence of hookworm and other infections. A uniform basis of marking the sanitary conditions of the homes in the infected districts with respect to soil pollution is desirable. The following system proposed by Stiles and Lumsden is useful: All privy and sewer types in use are classified under the heads "A," "B," "C," "D," E," and "F," and to each type is assigned its rating of efficiency on the scale of 100. The survey is made by counties and is based upon an inspection of at least 100 rural homes per county, taken at random in different localities. Usually from 200 to 700 homes per county are examined, and permanent record is made of their condition.

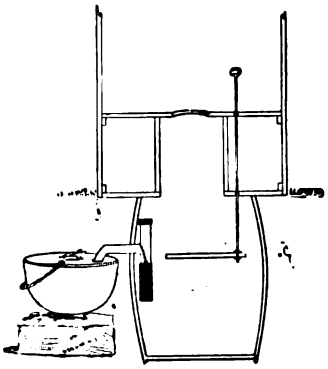
State Law for Morbidity Reports.—The intrastate control of public health matters is held to be a part of the police powers of the several States, and is therefore a power to be retained by the States. It is very desirable that the several States should enact uniform laws or promulgate uniform regulations as a means by which uniformity can be attained in the notification of the occurrence of sickness and morbidity reports in general. The annual conference of State and Territorial health authorities with the United States Public Health Service, provided for by act of Congress, approved July, 1902, held at Minneapolis, June 16, 1913, adopted a model law for morbidity reports. The Model Law as adopted by the conference is contained in Reprint No. 133 from Public Health Reports of June 27, 1913. Hookworm disease is made notifiable under this law.

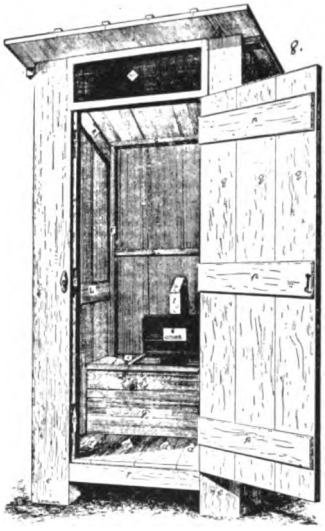
Prevention of Soil Pollution.—The most important measure needed to prevent the spread of hookworm disease is the proper disposal of human excreta. If the excreta be deposited in sanitary privies, and properly disposed of, soil pollution will be prevented and hookworm disease eradicated.

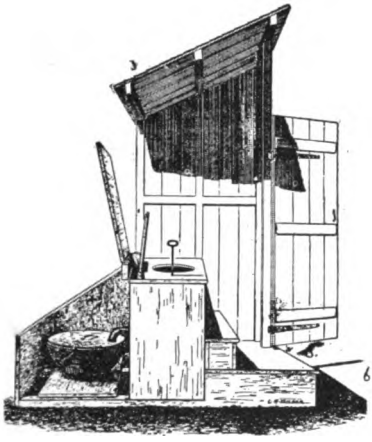
The Sanitary Privy.—To be sanitary a privy must meet the following conditions:

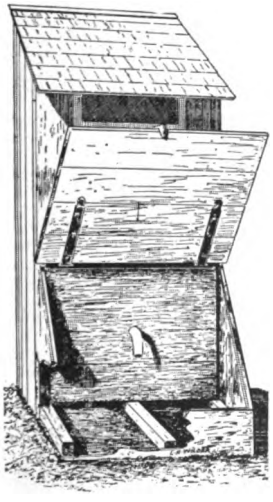
(1) The excreta must not touch the ground; hence some kind of watertight receptacle (box, pail, tub, barrel, tank or vault) for the excreta must be used under the seat.

Digitized by Google









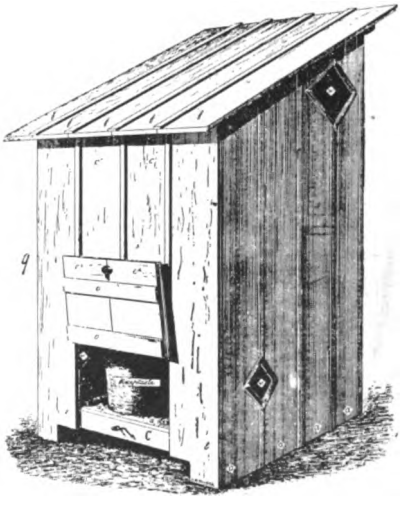


Fig. 5. Improved L. R. S. privy (after Stiles and Lumsden).
Fig. 6. Inside view of L. R. S. privy (after Stiles and Lumsden).
Fig. 7. Rear view of L. R. S. privy (after Stiles and Lumsden).
Fig. 8. A single-seated sanitary privy, front view (Stiles, 1910).
Fig. 9. Rear and side view of a single-seated sanitary privy (Stiles, 1910).

Digitized by Google

Digitized by Google

(2) Domesticated animals must not have access to the night soil; therefore the privy should have a trapdoor in the back to exclude them.

(3) Flies and other insects must not have access to the excreta; therefore the entire privy must be made rigidly flyproof, or some substance must be used in the receptacle to protect the contents from insects.

There are two types of sanitary privies, namely, the "dry system," and the "wet system." In the "dry system" privies, dry earth, road dust, wood ashes, or lime is kept in the privy and is scattered on the excreta every time the privy is used. In the "wet system" privies some fluid is used in the receptacle either (1) to disinfect the excreta, or (2) act as an insect repellant, (3) or to increase the destruction of disease germs in the excreta by natural fermentation. Each of the "systems" mentioned above has its advantages and disadvantages, but if the "wet system" is used in a properly constructed apparatus, it is the most advantageous from a sanitary standpoint. The apparatus known as the L. R. S. privy decreases the disadvantages and at the same time increases the advantages connected with the older types of outhouses. For a description of the method of construction and operation, and also a detail description of the various types of privies, and the advantages and disadvantages of both "systems," the reader is referred to Farmers' Bulletin 463, The Sanitary Privy, by C. W. Stiles and L. L. Lumsden.

Disposal of Night Soil.—All fresh night soil from a "dry system" privy should be rendered harmless by either burning it or by heat disinfection.

The burial or chemical treatment of night soil taken from a "dry system" privy cannot be depended upon as a means of rendering it harmless to life. In the "wet system" privies the excreta may be heated to 212 F., and then used as fertilizer. A second method which is not, however, entirely without danger, is to allow the filth to ferment in water contained in covered receptacles for a period of several weeks after its removal from the privy, and then add to it some reliable disinfectant, such as chloride of lime (one-fourth pound to each gallon of excreta) and then bury the material.

Digitized by Google

Eradication of the Infection in Man.—Next in importance to the prevention of soil pollution in a campaign against hookworm infection, is the eradication of the infection in man—diminish the amount of infection. To obtain satisfactory results along this line an efficient anthelmintic is required, which will destroy and expel the worms from the intestinal tract. In the treatment of hookworm disease the first indication is to attack the cause—treat the worms and not the patient. The intestinal canal of an infected person may be regarded in the light of a sewer which by reason of its contents has become a menace to the public health, and therefore should be promptly and thoroughly cleaned of all existing elements of danger. The establishment of dispensaries at convenient places throughout the infected localities from which medicine is dispensed to infected persons free of charge, or at small cost to the patients, would undoubtedly facilitate the work of eradicating the disease in man; and such an arrangement may also be made to serve as a valuable agent for the education of the profession and the general public in matters pertaining to sanitation and public health.

Immunity.—The existence of a definite racial immunity is exhibited by the negroes and Filipinos, but acquired immunity to hookworm disease does not occur. The negroes and Filipinos, although often found to harbor the infection, frequently show remarkable freedom from the severe symptoms of the disease. It is presumed, in explanation of the reason for this peculiar racial immunity, that as the negro has harbored hookworm infection for hundreds of generations he has fallen heir to a resisting influence towards the disease.

Education of the Public in Health Matters.—The sanitary habits of the general public, especially in the rural districts, has a most important bearing upon a campaign for the eradication of hookworm disease. Therefore, the education of the public in the principles of hygiene and sanitation is an exceedingly valuable adjunct, and should never be omitted from a campaign against the disease. This important branch of public health work is replete with difficulties and discouragements, and it is only through the exercise of persistent efforts, tact and good judgment, that satisfactory results can be obtained. As Rosenau

Digitized by Google

says, "Very little can be accomplished by force, and, if the customs and prejudices of the people are ignored, the reformer and the benefactor meet with rebuff and failure." Every possible effort should be made to awaken the intelligent interest of the medical profession in the infected districts, so that the profession will take the leading part in the conduct of the campaign. The subject should be presented to the public in as interesting and attractive form as possible, and to this end the program should receive the most careful study and arrangement. The liberal use of illustrations supplemented by lectures delivered in simple language which will appeal to the understanding and common sense of the people of the community, will be found to be a very effective means of attracting and holding the interest of the people, as a rule. The use of specimen exhibits, attractively arranged and explained, will usually appeal to the interest of many people. The distribution of popular literature in the form of pamphlets, newspaper articles, posters, etc., is sometimes productive of much good. In short, every available avenue by which knowledge of the disease can be disseminated should be utilized, including the children in the public schools; the libraries, the health authorities, the medical profession, the philanthropic agencies and the civic forces. The people should be brought to a proper realization of the importance of the strict adherence to habits of decency and cleanliness; the importance of having clean hands before eating; the avoidance of all uncooked vegetables which have been fertilized with human excreta; the importance of the proper protection of the feet by wearing shoes and stockings, and the exercise of proper care in avoiding work in contaminated soil unless gloves are worn.

Examination of Arriving Aliens.—As previously stated elsewhere, there is an abundance of evidence to show that much of the hookworm infection in the United States can be attributed to our alien population. Therefore, to control this avenue of infection it is important that all arriving aliens should be carefully examined, especially those coming from the Orient, for evidence of the disease, and all persons found to be infected should be refused admission to the country until cured of their

Digitized by Google

infection. In the examination of Orientals for hookworm disease but little dependence can be placed upon the diagnosis of the disease by means of the physical signs and symptoms, as a rule, because the disease has often been found in the Orientals by microscopic examination of the feces, when there was a striking absence of signs and symptoms of the disease.

List of References.

1. Stiles, C. W., Public Health Bulletin No. 32. Hookworm Disease.
2. Stiles, C. W., and Lumsden, L. L., Farmers Bulletin 463, U. S. Department of Agriculture. The Sanitary Privy.
3. Surgeon-General, U. S. Public Health Service. Annual Report, 1911.
4. Surgeon-General, U. S. Public Health Service. Annual Report, 1912.
5. The Rockefeller Sanitary Commission for the Eradication of Hookworm Disease. Hookworm Infection in Foreign Countries. 1911.
6. Castellani, Aldo, and Chalmers, Albert J., Manual of Tropical Medicine. Second edition. 1913.
7. Rosenau, M. J., Preventive Medicine and Hygiene. 1913.
8. Osler, Sir William, The Principles and Practice of Medicine. Eighth edition, 1912.
9. Schereschewsky, J. W., Medical Inspection of Schools. Public Health Reports, August 29, 1913.
10. Wilcox, Reynold Webb, Pharmacology and Therapeutics, sixth edition.

Digitized by Google

BERI-BERI.

By
PAUL G. WOOLLEY, M. D.,
University of Cincinnati.

The causes which have been assigned for the symptom-complex we call beri-beri are legion. Almost everything under the sun, and perhaps some above it, have been seriously discussed as etiologic factors. It has been ascribed to intestinal parasites, protozoa and bacteria, to occupation and to diet, and it has been suspected of being a collateral result of malarial infection and other infectious diseases, and of scurvy.

The most important theories of etiologic significance are the following:

(1) That the disease is the expression of the lack of some normal constituent of food, i. e., that it is due to nitrogen or phosphorus starvation.

(2) That it is the result of the presence of arsenic in the food.

(3) That it is the result of intoxication with products of decomposition of food outside the body, i. e., that it is a form of food poisoning.

(4) That it is a soil or place disease.

(5) That it is the result of intoxication by bacterial products in the body, especially in the gastrointestinal tract (Wright), or in the upper respiratory tract (Durham).

(6) That it is the result of infection.

(7) That it may be the result of any one or several of the above factors.

The important ones among these are the first, third and seventh. These I shall discuss briefly. The others are mentioned for the sake of completeness.

The *nitrogen starvation hypothesis* originally was based upon the fact that beri-beri is most frequent among rice-eating peoples and in general among those who subsist almost exclusively upon

Digitized by Google

food that is deficient in nitrogen. To test the validity of the theory, an experiment was made in the Japanese navy, which up to 1883 had shown a morbidity of 25 per cent. In 1884 the diet was changed, less rice was issued, and other articles of diet richer in nitrogen were substituted, with the result that the disease was almost abolished, and has remained a comparatively unimportant item in the sick list ever since. But the validity of the hypothesis was not proved by these dietary changes, for the reason that hygienic changes were instituted at the same time. Furthermore, inconclusive experiments following the same lines were made in the Malay States. Then, too, in other parts of the world where diet poor in nitrogen is used, beri-beri is of but limited extent. It also occurs in individuals who use a diet rich in nitrogen, as, for instance, among Norwegian and Swedish sailors. In certain of the Philippine Islands where rice was not the main diet beri-beri occurred (Heiser).

Frazer and Stanton brought evidence to support the suggestion of Braddon that a casual relationship exists between beri-beri and the use of white rice, and to account for the observation that persons who were in the habit of using rice that was parboiled before husking and those who used the primitive method of husking and winnowing were less subject to the disease than those who used rice which was not steamed before husking and those who used polished rice. It had been suggested that the parboiling was effective in destroying organisms that were present upon the grains (Braddon), and that the native methods of pounding and winnowing the grain left a sufficient amount of the pericarp and that in this was a substance that had antidotal effects upon a poison commonly present in white rice. It is unnecessary to discuss the presence of such a poison. It has not been proved to exist. Nevertheless there has been, in certain localities, an apparent relation between the use of polished milled rice and the beri-beri incidence. It is of some interest that rice which has been supposed to be the causal factor in the production of beri-beri also has been able to produce an analogous disease in fowls (*polyneuritis gallinarum*), while parboiled rice does not produce such results, though after extraction with alcohol and subsequent careful drying, it will produce the same

Digitized by Google

effect. The observed facts lead to analyses of the various sorts of rice, analyses that resulted in the discovery that certain rice, especially the "White Siam," was markedly deficient in fats and somewhat low in ash. It was also found that the phosphorus content of rice which produced polyneuritis in fowls was far below (about 50 per cent) that of parboiled rice, while the polishings collected at a rice mill contain a large amount of phosphorus. It was estimated that one fowl required 60 grammes of parboiled rice to maintain phosphorus equilibrium, and that, using polished rice, an additional 3.5 grammes of polishings was necessary. It appears then from recent work that a diet poor in phosphorus is able to produce in fowls a disease analogous to beri-beri, and that the lack of phosphorus in polished rice is the result of the milling methods used in polishing the grains, since the greater part of the phosphorus of the rice is held in the pericarp. Parboiling renders the removal of the pericarp more difficult.

Notwithstanding the fact that many investigations have supported, in a general way, the phosphorus doctrine, there remains the possibility that something beside the mere phosphorus content of the food is at fault. Aron, and Aron and Hocson believed, upon the basis of their experimental evidence, that both phosphorus and nitrogen play a part, and de Haan that something beside phosphorus is at fault. He thinks it is neither salts nor nucleins. Perhaps it is the lipoids. Shibayama does not think that overmilled white rice is the sole cause of beri-beri. His experiments with miners seem to show that workers who received fresh unmilled rice were more susceptible to beri-beri than those fed exclusively with milled rice. Shibayama comes to the conclusion that a monotonous one-sided diet predisposes to beri-beri, and *only* predisposes to it. The immediate cause he does not specifically suggest, but he calls attention to the interesting fact that in beri-beri districts many persons become affected with beri-beri during convalescence from typhoid fever, a thing which does not happen in other districts. This fact, Shibayama believes, points to the existence of a still unknown beri-beri organism. He, however, aparently fails to take recrudescence into consideration.

Digitized by Google

The conception of a badly balanced diet as a predisposing cause seems a not unreasonable one in view of the fact that limited diets have a harmful effect on many animals as well as upon human beings. Wherry, Hunt and others called attention to the fact that the resistance of animals to infection is lowered by such diets. Wherry found, for instance, that when guinea pigs had been fed upon an exclusive diet of barley and water, they became scorbutic and that then they showed a greater degree of hemorrhagic extravasation when inoculated with palgue than was the rule with other guinea pigs fed with a more normal diet. Hunt said, that "diet has a marked effect upon the resistance of animals to certain poisons," and further, "that foods such as enter largely into the daily diet of man have most pronounced effects upon the resistance of animals to several poisons; they produce changes in metabolism which are not readily detectable by methods ordinarily used in metabolism studies. The ease and rapidity with which certain changes of function are caused by diet are in striking contrast with the essentially negative results obtained by the chemical analyses of animals fed on different diets." Such a lowering of resistance plus the additional specific effects upon the nervous system caused by lack of certain necessary salts of phosphoric acid might well be conceived to be the cause of the symptom complex of kakke.

Infected food, more particularly decayed fish and old spoiled rice have been under suspicion of producing beri-beri.

Fish, however, has been excluded from the probable general causes, because, during epidemics in which food stuffs have been under control, as for instance, in a Kuala Lampur epidemic, no fish was used.

Rice, on the other hand, is still under suspicion. Braddon's theory is that the husk of the rice grains may contain a fungus which is able to penetrate the bruised and decorticated grain, and that only certain crops of rice are infected with the fungus and only, perhaps, the crops from certain places. In support of this is the fact that the Tamils steam or boil their rice before husking, while the Chinese do not, and that outbreaks of the disease may be stopped by changing the rice. In northern Siam epidemics occur during high water at times when fresh rice is

Digitized by Google

not to be had, and when all other vegetable diet is excluded because of the general conditions. During these times the Laos subsist entirely upon the rice of previous seasons, and this in seasons when the conditions of temperature and moisture are most favorable for the growth of fungi in the rice of the storehouses. With opportunity for obtaining new rice or other food the epidemics cease. One might refer such epidemics to a combination of nitrogen starvation plus intoxication from spoiled rice.

There is the possibility that a combination of two or more of the above mentioned factors may account for the disease, a possibility that seems most probable, inasmuch as the pathologic changes are not pathognomonic and merely indicate an intoxication of mild or severe character which results in a peripheral neuritis associated with myocardial, vascular, and voluntary muscular changes. In the foregoing paragraphs this possibility has been emphasized, and it seems to be one which has attracted the attention of very many of the modern writers. Aron and Hocson emphasize this when they say that "It is highly probable that living for an extended period on a one-sided, almost exclusively vegetable diet, which is characterized by its poverty in phosphorus and protein, may result in beri-beri." That is to say, not merely does the disease result from phosphorus but also nitrogen starvation. But it still seems very probable, as Shibayama and others assert, that these dietary deficiencies are merely predisposing and not immediately causative. Brooks mentioned the fact that beri-beri was observed in the Straits Settlements ten years before steam-milled rice was in use; Kilbourne stated that it was present in the Philippines before the use of polished rice was in vogue, and Highet made a similar remark for the occurrence of beri-beri in Siam. I know personally that beri-beri epidemics have appeared among the Laos of northern Siam who used no other rice than that which was pounded, and not milled. All of these, and other facts, point to the conclusion that some other factor than lack of phosphorus and nitrogen concerns the appearance of the disease, and this, taken together with the pathologic facts, point to a lack of unity in this missing factor. Barbezieux goes to another extreme and calls in an hypothetical neuro-arthritic diathesis. But he

Digitized by Google

also says that beri-beri is a syndrome which depends upon nutritional disturbances. Aron and Hocson suspect that some unknown factor exists that causes the "wet" form, a suspicion which has been supported by Vedder and Clark.

The facts that there is generally some relation between the use of rice and the beri-beri incidence; that the use of undermilled rice seems to decrease the incidence; that when polished rice is combined with either the millings, or with extracts of the millings, the incidence is less; that the use of millings, or extracts of millings, serve usefully in the treatment of beri-beri —all these facts have turned research to the discovery of the vital element in the rice, in the absence of which beri-beri appears. Whether the active substance is a phosphorus compound one or not; whether it is a salt or a lipoid has held the attention of many workers, among whom may be mentioned Frazer and Stanton, Chamberlain and Vedder, Schaumann, Shiga, Strong and Crowell, Funk and Suzuki.

The fact that when rice contains less than a certain minimum of phosphorus, as estimated by the P_2O_5 content, beri-beri is apt to appear to lead to the conception that the protective substance was a phosphorus containing substance and yet the material which Funk has separated, and which he calls "Vitamine," for which he assigns the formula

$$\begin{matrix} NH\diagdown \\ CO—C_{16}H_{18}O_6 \\ NH\diagup \end{matrix}$$

Funk's base, Vedder and Williams say, is capable of promptly relieving the paralysis in dry beri-beri, while the extract prepared by them (V. and W.) promptly relieves the attacks of cardiac insufficiency and dissipates edema, but has no effect upon the paralysis of the dry form. Funk's base can be precipitated from extracts. The other material, which relieves the edema, remains in the filtrate. The conclusions of Vedder and Williams are of interest in this connection and are therefore given in full. They are as follows:

1. Undermilled rice may be stored for one year in a damp place without losing its protective powers against polyneuritis gallinarum. It is improbable,

Digitized by Google

therefore, that a rice which originally affords protection against beri-beri will lose this property by storage even in damp places.

2. The neuritis-preventing substances, or vitamines contained in rice polishings are only slightly soluble in cold 95 per cent alcohol, since three successive extractions, using a total of 6 litres of alcohol to each kilogram of polishings, fail to remove all of the neuritis-preventing substances from rice polishings.

3. Strongly alkaline reagents, such as sodium hydroxide, ammonia, and barium hydroxide, destroy the neuritis-preventing vitamine in its free or unhydrolyzed state, and the use of these reagents must be avoided in endeavoring to isolate this substance.

4. Basic lead acetate does not precipitate the neuritis-preventing vitamine, and a considerable portion of this substance may be recovered from the filtrate.

5. The therapeutic properties of an alcoholic extract of rice polishings are greatly altered by hydrolysis (treatment with 5 per cent hydrochloric or sulphuric acid). The unhydrolyzed extract is not poisonous and is only slowly curative. The hydrolyzed extract is exceedingly poisonous in large doses and promptly curative in small doses.

6. We have confirmed Funk's observations by isolating a crystalline base from an extract of rice polishings by Funk's method. This base in doses of 30 milligrams promptly cured fowls suffering from polyneuritis gallinarum.

7. Funk's base or vitamine is present in rice polishings in considerable amounts, and only a very small portion of it can be obtained by Funk's method—

(1) Because the polishings themselves are incompletely extracted.

(2) The greater part of this base is lost during the chemical manipulations required by Funk's method as shown by the facts:

(a) The curative action of this base, isolated, is from twenty-five to fifty times weaker than the curative action of the original hydrolyzed extract.

(b) When fowls are fed on polished rice and given a daily dose of this base in amounts corresponding to 10 cubic centimeters of the original extract, these fowls are not protected. Ten cubic centimeters of the original extract or 10 grams of polishings daily are amply sufficient fully to protect fowls.

(3) Because Funk's method depends upon the use of barium hydroxide, and we have shown that this reagent destroys this base.

8. Two groups of substances (purine bases, choline-like bases) may be isolated from rice polishings in addition to Funk's base and are capable of partly or wholly protecting fowls fed on polished rice against polyneuritis gallinarum, but are incapable of curing fowls that have already developed the disease. The chemical nature of these two groups of bases requires further investigation.

Digitized by Google

9. We have confirmed the observation of Suzuki, Shimamura, and Odake, that Funk's base may be precipitated from unhydrolyzed extract by tannic acid, but did not succeed in obtaining large amounts of this substance by this method.

10. It is probable that this base or vitamine exists in food as a pyrimidine base combined as a constituent of nucleic acid, but that it is not present in the nucleus or nucleic acids that have been isolated by processes involving the use of alkalies or heat.

11. The administration of unhydrolyzed extract of rice polishings to cases of adult wet beri-beri, or to cases suffering from acute cardiac insufficiency, results in the prompt dissipation of edema and relief of the cardiac symptoms.

12. The administration of unhydrolyzed extract of rice polishings to cases of dry beri-beri is followed by little or no improvement in the paralytic symptoms.

13. The administration of Funk's base to cases of dry beri-beri is followed by an immediate improvement in the paralytic symptoms. This should remove the last doubt that dry beri-beri is caused by the deficiency of this substance in the diet. It also finally proves that dry beri-beri of man and polyneuritis gallinarum are essentially the same disease.

14. We have succeeded in curing a case of infantile beri-beri (or the wet type) by administering that portion of the extract of rice polishings represented by the filtrate from the phosphotungstic precipitate. Since this filtrate does not contain Funk's base, this is evidence that wet beri-beri is cured by some other substance.

15. Conclusions 11, 12, 13 and 14 are striking confirmatory evidence for the hypothesis previously stated by Vedder and Clark that wet beri-beri and dry beri-beri are two distinct conditions, each being caused by the deficiency of a separate vitamine.

The exceedingly small amounts of these so-called vitamines which are effective suggest that they are not in the nature of foods, so much as they are stimulators of types of metabolism. Their action is similar to that observed by Osborne and Mendel in their experiments with purified proteins which in minimal amounts allowed animals to live and preserve a nitrogen equilibrium, but which did not allow for growth. The addition to such pure diets, of a minimal amount of milk or milk whey, too little to serve as food, made growth possible. Whether the substances which call forth such effects are stimulators or activators we cannot say. Considerable work remains to determine the mechanism of the effects.

Digitized by Google

Bibliography.

Aron. *Philippine Journ. of Science* (B), 1910, V. 81.

Aron and Hocson. *Ibid.* 1910, V. 98.

Baelz and Miura. Mense's Handb. d. Tropenkrankheiten, 1905, II, 140 .

Barbezieux. *Rev. de Med.* 1911, XXXI, 81.

Braddon. *Journ. Trop. Med.*, 1909, p. 212.

Breaudet. *Bull. Soc. Path. Exot.*, 1910, III, 13, 123, 65. *Ibid.*, 1910, III.

Breaudet et Dender. *Ann. de l'Inst. Past.*, 1911, XXV, 167.

Brooke. *Philippine Journ. of Science* (B), 1910, V. 137.

Chamberlain and Vedder. *Philippine Journ. of Science*, 1913, VIII, Sec. B, p. 175.

Durham. *Journ. of Hyg.*, 1904, VI, 113.

Duerck. Ziegler's Beitrage Suppl. VIII, 1908.

Edie, Evans, Moore, Simpson and Webster. *Biochem. Journ.*, 1312, VI. 234.

Frazer. Trans. Soc. Trop. Med. and Hyg., 1910, III, 257.

Frazer and Stanton. *Philippine Journ. of Science*, 1910, V. 55.

———— An Inquiry concerning the Etiology of Beri-beri. Singapore, 1909. Kelly & Walsh.

Funk. *Journ. Physiol.*, 1912, XLV. 80.

Funk. *Journ. Physiol.*, 1911, XLIII. 26.

Guerro. Bull. Manila Med. Soc. 1910. 11, 243.

Guerro y. Quintos. *Revista Filipina Med. y. Farm.*, 1910, 1, 1.

de Haan. *Philippine Journ. of Science*, 1910. V. 65.

Heiser. *Journ. Amer. Med. Assoc.*, 1911. LVI. 1237.

Highet. *Philippine Journ. of Science*, 1910, V. 73.

Hulshoff. *Arch f. Schiffs-u. Tropen-Hygiene.* 1910, Beiheft 3.

Hunt. Bulletin No. 69, Hygiene Lab. U. S. Pub. Health and Marine Hosp. Serv. 1910.

Janin. *Rev. de Med. et d'Hyg. Tropicale*, 1910, VIII, 30.

Kilbourne. *Philippine Journ. of Science*, 1910. V. 127.

Manson and Daniels. A System of Medicine by Albutt & Rollston. 1909, Vol. II, pt. 2, 615.

Ross. *Lond. Lancet*, 1900, II. 1677.

Schaumann. *Arch. f. Schiffs u. Tropen-Hygiene*, Beihert 8, 1910.

Scheube. Die Krankheiten d. Warmer Laender. G. Fischer. Jena 1910. p. 500. (Literature.)

Shibayama. *Philippine Journ. of Science*, 1910. V. 123.

Shiga and Kusama. *Arch. f. Schiffs u. Tropen-Hygiene*, Beihert 3, 1911.

Strong and Crowell. *Philippine Journ. of Science*, 1912. VII. Sec. B, p. 271.

Suzuki, Shimamura and Odake. *Biochem. Zeitschr.*, 1912. XLIII, 39.

Vedder and Williams. *Philippine Journ. of Science*, 1913, VIII Sec. B, p. 175.

Wherry. *Journ. of Infect. Dis.*, 1909, VI. 564.

Wright. *Journ. Trop. Med.*, 1901. p. 245.

Woolley. Forchheimer's Therapeusis of Internal Diseases

Digitized by Google

Preventive Vaccination Against Typhoid Fever*

By
PROFESSOR A. CHANTEMESSE,
of Paris.
Translated by Chas. Chassaignac, M. D., New Orleans.

The rapid extension of antityphoid vaccination among civilized nations as well as the passage of a law instituting this vaccination as compulsory in the army by the French Senate, and very soon probably by the Chamber of Deputies, has drawn the earnest attention of physicians. They realize that, after the army, other collectivities will be made subject to this hygienic preventive measure, beginning with orderlies, nurses, and later, students, etc.

The most important role in the practice of this vaccination will be played by the physician. Hence it is necessary that he should be posted from both the scientific and the practical sides of this new method of prophylaxis against typhoid fever. They must learn its great advantages, and also its deficiencies concerning which, it seems to me, too much silence is kept.

When the experimental discovery of sterilized antityphoid vaccine was made in France more than a quarter of a century ago, few persons attached any importance to these laboratory demonstrations. The mind at that time was far from calculating the possibilities of human ordinary realities.

In 1909 I asked the Academy of Medicine to name a commission to study this new method of prophylaxis. This was the starting point of the development of antityphoid vaccination in France. Thanks to a favorable vote of the Academy and to the efforts of two men, a bold minister of war, Mr. Messiny, who, before taking action, studied the question, and a director of the Health Service, Inspector General Fevrier, whose role in the history of antityphoid vaccination is passed too much in silence—the method was applied to the troops of Oriental Morocco in August, 1911.

*From the *Monde Medical*, No. 511, March 15, 1914.

Digitized by Google

To the chiefs who had assumed the responsibility of this measure, and to those who applied it the first question was regarding the efficiency of the vaccine. I believe that it is generally settled to-day. Now, however, since the eloquent intervention of the medical inspector general, Delorme, before the Academy, a problem is presented which had not yet been the subject of systematic study, that of the possible drawbacks of this vaccination. For, while there is only one antityphoid vaccine, the chemical substance called typhoid toxine, the practical methods used in its preparation vary somewhat, and certain vaccinating liquids may present more or less disadvantages than others. This statement is not based on imagination. Certainly not. Just as I asked in 1909 that an inquest be held as to the efficiency of the vaccine do I insist to-day upon the necessity of studying and comparing the objectionable features of the preparations used to vaccinate in the army.

As documents interesting the future vaccinators, the physicians, I wish to publish the data which will follow. I present them without passion or prejudice, with the single purpose of seeking the truth.

History of the Discovery of Antityphoid Vaccination.

Previous to 1887 no one had said nor shown that laboratory animals could be vaccinated against typhoid infection by means of a few subcutaneous injections of *non-living* typhoid toxins.

In April, 1887, I had published with Widal in the *Archives de Physiologie* the fact that the gelatin on which had been grown the typhoid bacillus, on which it had excreted its soluble products, was "vaccinated," we said, against an ulterior development of this same microbe. Thence to the application to animals of this vaccination with soluble products was but a step. In May and June, 1887, the students witnessed these experiments at the course on bacteriology held in the laboratory of Prof. Cornil. They became known to the students, and Dr. Roux, with his accustomed loyalty, mentioned them in his work (Annales de l'Institut Pasteur, 1887, p. 571).

Our memoirs on the subject, published in collaboration with Widal, appeared in the "Annales de l'Institut Pasteur in 1888

Digitized by Google

and 1892. We established then for the first time, that immunity could be conferred preventively against the microbe of typhoid fever, upon animals sensitive to this virus, by giving them three or four subcutaneous injections of a culture of typhoid bacilli perfectly sterilized by heat at intervals of a few days.

All previously known preventive vaccinations utilized only attenuated but living microbes. In order to demonstrate that we proposed a new method of antityphoid vaccination based on the use of a non-living vaccine, army cultures were sterilized energetically. We heated them to 120 degrees C. (1887-1888), and later (1892) to 100 degrees C.

To-day the question of priority in the discovery experimentally of the non-living vaccine of typhoid is presented very simply; the experiments published by us in 1888 to 1892 are either accurate or they are not and in the latter event we possess no right of priority in the discovery of the inanimate vaccine of this disease.

Until recently, no question as to their validity had been raised. Those who from 1896 have applied our method to the vaccination of man (Wright and his pupils in England; Pfeiffer and Koller in Germany) were content never to mention our experiments which had preceded their own by a long period. Recently in France the attempt has been made to despoil us of the benefit of our experiments, a quarter of a century old, under the pretext that our vaccine was too much heated and that heat must have deprived it of all immunizing power. On the other hand, it was added, France is rich enough in scientific work to leave to foreigners the credit of the discovery of antityphoid vaccination.

Well, to settle the debate, it would have been sufficient to repeat our experiments. Had they been repeated by those who criticized them? Never in the world (see Societe de Biologie, May 3, 1913). And what has been the result of the researches of those who did repeat them? A complete confirmation of what we claimed twenty-five years ago.

With the powder of typhoid bacilli heated for *two hours* at 120° C., Friedberger and Moreschi immunized animals by means of a single intravenous injection. It was objected that this ex-

Digitized by Google

periment was without confirmatory value, as to our researches, because the dry bacilli powder resisted heat better than the moist culture we had used. This criticism does not bear examination and any physician may be convinced by reading of the control experiments instituted by Sanarelli over twenty years ago. In a celebrated memoir on experimental typhoid fever, published in the *Annales de l'Institut Pasteur* (1892), this scientist affirms typhoid bacilli heated to 120°, immunized in a few days, *without exception*, against virulent typhoid septicemia (page 744). He adds (page 746) that he has thus been able to vaccinate uneventfully, forty guinea pigs. He heated the liquid cultures as we had done five years previously.

Recently (*Journal Excelsior*, Dec. 27, 1913), Prof. Vincent affirmed that our experiments of 1887, 1888, 1892, had no value. A sufficient retort is to reproduce here Prof. Vincent's statement before the Academy of Medicine (meeting of June 21, 1910): "The important work of Chantemesse and Widal has demonstrated since 1888 the possibility of protecting animals against the inoculation of living cultures by an anterior injection of typhoid bacilli killed by heat." The reader may judge between the opinion heralded in 1913 by Vincent and that professed on the same subject in 1910.

That improvements upon our first procedure have been devised since that remote period, I am the first to recognize, notably that relating to the degree of heating. We had reduced it ourselves in 1892 from 120 to 100 degrees. Subsequently, Bruschettini heated to 60° C. and Pfeiffer and Kolle in Germany and Wright in England held to the latter in applying our method to man. Later the temperature was further lowered and actually I heat only to the point sufficient to cause sterilization. However, these successive improvements do not affect the principle and all preparations used to vaccinate in the various armies are still only sterilized typhoid toxine.

I take advantage to-day of the improvements of others just as the others profited anteriorily by my researches. If I claim loudly for my collaborator, Prof. Widal, and myself the credit for the discovery of the principle of the method, I admit that

Digitized by Google

the honor of its first application to man is due to two German scientists, Pfeiffer and Kolle.

Fifteen years ago (1889) I instituted in France, preventive vacination against typhoid fever, by the injection of heated vaccine, to immunize the students following my typhoid service at the hospital du Bastion. My internes at that time were Dr. Armand Delille and Prof. Guerbet, of Rouen. None of them have since contracted typhoid fever, although Prof. Guerbet twice had occasion to be infected by the introduction into the mouth of a typhoid culture contained in laboratory pipettes.

Many attempts have been made to obtain more and more efficacious antityphoid vaccines. I am leaving aside those representing the use of living typhoid bacilli, whether after simple attenuation by means of slight heating or simple lavage with water, or lavage and sensitization. It is not demonstrated, in my opinion, that such preparations can be, *in all cases,* harmless, at any rate in persons predisposed to typhoid fever, or in relation to receptive soil, as it is termed to-day.

As long as it remains established that a lasting immunity against typhoid fever can be conferred by means of a sterilized toxine incapable of multiplying in the human body, the choice of this method of vaccination will seem to be preferable.

These results are tabulated from official documents furnished by the ministry of war, the ministry of naval affairs and by the physicians who have vaccinated among the civil population and whose reports are on file in my laboratory.

In the French Army during 1912, among troops stationed in France, Algeria, Tunis and Morocco, of whom 2,644 were vaccinated and 60,581 non-vaccinated, the morbidity among the former was 0 and the latter 1,354, or 22 1-4 per cent; the mortality 0, and 174, or 2.85 per cent.

In the navy, from April, 1912, to December, 1913, the vaccinated numbered 4,698, against 66,254 non-vaccinated; the morbidity was 0 in the former to 580, or 8 per cent, in the latter; the mortality being 0 and .6 per cent, respectively.

Among the general population in France, in the colonies and in foreign countries, in a few foreign armies, notably in Belgium, the vaccine has been utilized and the number of persons

Digitized by Google

having received the vaccine has reached more than seventy thousand. The vaccination has spread into Spain, Portugal, the Canary Islands, England, Belgium, Denmark, Switzerland, Egypt, Italy, Sicily, Greece, Roumania, Russia, Turkey, in Europe and in Asia; America (Canada, Colombia, Costa Rica, Ecuador, Guatemala, Venezuela, Brazil, Argentine and Uruguay).

I have not quite complete reports obtained during the last two years, by means of this antyphoid prophylaxis. I have written to the physicians receiving the vaccine and they have not all answered. A number of them, however, have given me exact reports on fourteen thousand of their vaccinated. Well, among those several thousand immunized over the world, I have had the satisfaction, nay the surprise—as I did not expect such a striking result—to learn that during the course of the last two years none have contracted typhoid fever, no matter how dangerous their sojourn in the country they inhabited, no matter what their profession (orderly, etc.), no matter what the contact with the sick, no matter in what epidemic focus the disease was prevailing among the non-vaccinated. The only instance I shall mention, in order to omit nothing, is as follows: A young nurse, vaccinated two months previously, contracted a febrile disease, characterized by a parotiditis, lasting two or three weeks and perfectly cured. No blood culture was made and the diagnosis remained uncertain.

I might mention a number of small epidemics arrested by preventive vaccinations of those around the sick. (The author quotes here some half-dozen striking instances). These reports seem sufficient to demonstrate the unhoped-for efficiency of the vaccine as soon as the four injections have been given. A remarkable thing is that if during an epidemic, a case of typhoid fever breaks out among the inoculated previous to the termination of the preventive treatment, the disease is always benign, as if the patient was already benefiting by a beginning of immunization. Children stand vaccination even better than adults. I have vaccinated children two or three years old without a shadow of difficulty. I have also vaccinated a number of pregnant women without harm.

Digitized by Google

Qualities of the Vaccine.

I would not like to close this communication without speaking of some points regarding the propagation of this method of prophylaxis. I shall review the problem of the quantity of vaccine to inject, of the method of its preparation, of the duration of the immunity it confers, and, finally, the question of its innocuousness or its possible drawbacks.

Quantity.—Widal and I had shown in 1888 that three or four preventive injections of heated vaccine had to be made in order to confer a substantial immunity upon animals. When subsequently Pfeiffer and Kolle and Wright applied this method to man they lowered the degree of heat, as had done *before them*, Bruschettini, but they erred in giving and advising only two injections instead of four, as advised by us. Hence the results of the vaccinations in Germany and in England while very fine, remain less favorable than those obtained in France, where, remaining faithful to the experimental teachings of 1888, we made four instead of two injections of no matter, which preparation is used—sterilized by heat or by an anesthetic. The Americans resort to three and that is why their results are better than those of the English.

The latter, in fact, inject only fifteen hundred millions of sterilized bacilli, the Americans two billions and a half, while I use three billion dead bacilli, which are absorbed without difficulty or inconvenience, as will be seen. The figure of three billion bacilli injected is accurate, for it has been verified by the Belgian military physicians, who claim to have vaccinated successfully at the military hospital of Ghent, 750 of their soldiers (see *Archives Medicales Belges,* of 1915).

The question of the quantity of toxin contained in the vaccinating dose, measured by the number of bacilli injected, is then very important, although it has been overshadowed by the excessive importance given to the method of sterilization of the bacilli.

Duration.—The average duration of the immunity conferred by the vaccine is difficult to determine; it is much longer, in my opinion, than has been thought, and the case of Prof. Guerbet,

Digitized by Google

mentioned above, is a proof of it. The practice of prophylactic antityphoid vaccination is yet too recent to furnish us all the data requisite to solve the problem. However, the following observation has been made in the American Army, where only the heated vaccine is used, establishing a comparison between the immunity due to the Jennerian vaccine and that due to the antityphoid vaccine. In the United States Army, Major Russell says, "Prevention of variola is assured as well as possible by revaccination and yet there were 21 cases of smallpox in 1908; in 1909, seven cases; in 1910, seventeen cases; in 1911, twenty cases. A total of, in four years, of seventy-five cases of variola, with two deaths; while with antityphoid vaccination, in the same army (heated vaccine) and during the same lapse of time, there were only twenty-seven cases of fever, with one single death."

Quality.—The vaccine I have used is the heated monovalent. Answering why I have not used a polyvalent bacillary vaccine introduced by Wassermann, ten years ago, it is because the experiments made in Germany have demonstrated that this vaccine was less efficacious than the monovalent in the prevention of true typhoid fever, and I have not resorted to it, owing to a reason which has seemed decisive to me. The English, as is known, have long practiced this vaccination and they have observed that the monovalent vaccine had given the same result everywhere, the same and equal degree of success in the North or in the South, in the East or in the West of their empire, in the cold climates or in the tropical regions.

Leishman declared, after investigation, at the Congress in London, that polyvalence in the eyes of the English antityphoid vaccination service was a complication without practical value.

On the other hand, I have remained faithful to the vaccine sterilized by heat, not only in recollection of our experiments of 1888, but because the observations of the English physicians, of Harrison, Leishman, etc., dating back already seven years (*Journal of the Royal Army Medical Corps,* Vol. 8, pages 472-1907), have demonstrated that the vaccine sterilized with chloroform while doubtless good was inferior in efficiency to the heated vaccine.

Digitized by Google

The sterilization of vaccine by means of chloroform was used in England long before this method of sterilizing with a volatile anesthetic, intended to disappear after the death of the microbes, was employed in France and given as an entirely original method. Neither through its agglutinating nor its bactericidal power has the chloroform sterilized vaccine shown itself superior to that sterilized by heat.

I have remained faithful to the use of the heated vaccine, especially because heat is a simple, sure and powerful method of sterilization, not subject to mishaps and accidents. With a good thermometer and a little care any worker can prepare vaccine of unquestionable quality. In nearly two million individuals over the world who have been given heated vaccine, what accident has been observed, what local or general complication? Never in France, never abroad has there ever been any accident, any disaster, any death. Never, either, has there occurred with the heated vaccine the grave accidents observed within a few hours after vaccination with other preparations and which have been attributed, erroneously in my opinion, to direct introduction of the vaccine in a vein. An important detail regarding the heated vaccine is that the heating process while allowing it to retain the immunizing properties, robs it of most of its irritating substances. One may be convinced of this by the unbiased and controlled statistics of 1,400 vaccinating injections made by me at the Hotel Dieu within two years, wherein are recorded the local and general reactions produced. It is an example in short of what has happened everywhere.

Here are the results in the 1,400 injections: The local reaction in all has been so slight that it is unnecessary to mention. General reactions have been absent in 1,184 cases; in 179 light, that is, causing within a few hours a rise of temperature to 38° or 38.5° C.; medium, that is, not going beyond 39°, 33 times; strong, that is, with an elevation to 39° and 39.5°, only 7. In a great majority of these cases, the reaction is caused by the first or second dose, and the following injections, while larger, cause no trouble whatever. It is important that the vaccinated be warned of these facts in order that the necessity for four injec-

Digitized by Google

tions, conferring a powerful immunization without shock, be understood.

Wherever the heated vaccine has been utilized, the same benign reactions have been observed. As a proof I shall quote a passage from the letter kindly addressed to me by the minister of the navy last December, in forwarding the statistics of results of the antityphoid vaccination: "I should add that in the cases in which local or general reactions have been observed, following the vaccinations, these reactions have always been of the slightest and that they have never led to invalidism of any length nor to disturbance in the service."

Here is the opinion of the Belgian physician Stainforth, director of the military hospital at Ghent, to whom I had sent some heated vaccine: "The sequels of the preventive innoculations given to 750 soldiers have in all cases been quite benign, locally as well as constitutionally. We have observed no lasting malaise nor serious febrile paroxysm. Everything worked favorably."

I must recall the fact that in all foreign armies without exception the heated vaccine is used and has just been chosen in Russia.

The mild reactions of which I have spoken have reference only to those following the use of the heated vaccin and not to those provoked by other vaccinating preparations which are, I have learned, much more powerful.

Further, there is an imperious need for information regarding the effect of these powerful reactions on the evolution of a latent tuberculosis. How frequently does tuberculosis become unmasked to progress rapidly after the heavy shocks due to vaccinating injections? If antityphoid vaccination is to become obligatory, we have the right to demand that the preparation be selected which depresses and alters the organism of the vaccinated to the least extent. A comparative test must be made as to the efficiency and the disadvantages respectively of the two vaccinating preparations in order that the whole truth be known in regard thereto.

Digitized by Google

ANNOUNCEMENT

THE AMERICAN SOCIETY OF TROPICAL MEDICINE.

The Eleventh Annual Meeting of the American Society of Tropical Medicine Will Be Held in Boston, Friday and Saturday, May 29 and 30, 1914.

Officers:

President, Dr. Richard P. Strong, Boston.
Vice President, Dr. Creighton Wellman, New Orleans.
Vice President, Dr. Charles F. Craig, Fort Leavenworth.
Secretary, Dr. John M. Swan, Rochester.
Assistant Secretary, Dr. Allen J. Smith, Philadelphia.
Treasurer, Dr. Joseph D. Weis, New Orleans.

Councillors:

(To serve one year):

Dr. Henry J. Nichols, Washington.
Dr. Roger S. Morris, Clifton Springs.
Dr. Seale Harris, Mobile.

(To serve two years):

Dr. C. C. Bass, New Orleans.
Dr. J. H. White, New Orleans.

PRELIMINARY PROGRAM.

The President's Address, Dr. Richard P. Strong.

"The Blood in the Tropics," Dr. Weston P. Chamberlain.

A paper on spirochetes, Dr. S. Burt Wolbach.

"Spirochetes and Fusiform Bacilli in Various Tropical Lesions," by Dr. Weston P. Chamberlain.

Digitized by Google

"Observations Upon the Morphology, Life Cycle and Relation to Disease of Entameba Histolytica," Dr. Charles F. Craig.

A paper on ameba, by Dr. Andrew L. Sellards and Dr. Walter Baetjer.

"The Method of Transmission of Several Insect-borne Diseases of South America," Dr. Charles T. Brues.

"A Description of Philippine Specimens of Paragonimus from Man," Dr. Philip E. Garrison.

"Acidosis in Cholera," Dr. Andrew L. Sellards.

"The Effect of Ultraviolet Light on Protoplasm," Dr. Beebe.

"The Occurrence of Malaria in Connecticut," Dr. Fritz Hyde.

"Malaria," Dr. C. C. Bass.

"Splenic Anemia," Dr. J. D. Weis.

'The Behavior of the Hansen Bacillus in Vitro," by Dr. C. W. Duval.

"Observations on Free Living and Pathogenic Ameba, with Especial Reference to Their Biology and Clinical Significance," Maurice Couret.

"The Isolation of Diphtheroid Organisms From Lymphadenomatous Tissues of Man," John A. Lanford.

Digitized by Google

NEWS AND COMMENT

Major P. M. Ashburn, U. S. A., has gone to Ancon, Canal Zone, to establish a board for the study of tropical diseases.

On March 19 a conference was held by the New York Academy of Medicine on the cost of clean and wholesome food.

The National Drainage Congress meets at Savannah, Ga., on April 22-25. A number of papers on malaria eradication are announced.

A sum of $2,000,000 is being applied by the King of the Belgians to the stamping out of sleeping sickness in the Congo.

The members of the Thompson-McFadden Pellagra Commission have returned to Spartansburg, S. C., to resume the study and treatment of pellagra.

Lieutenant Colonel George D. Deshon, U. S. A., has been ordered to report to the Governor of the Panama Canal Zone on May 1, for duty as superintendent of the Ancon Hospital.

Cases of leprosy have been reported in California among Mexican refugees. The California State Board of Health has passed a resolution making leprosy a quarantinable disease.

A warning has been sent out in Panama against the native oysters. Several cases of typhoid are attributed to this cause. Laboratory examination showed the oysters to be contaminated by sewage.

Dr. John W. Colbert, Albuquerque, New Mexico, has been asked to take charge of a campaign for the eradication of hookworm disease to be carried on in Central and South America by the Rockefeller Foundation.

Digitized by Google

In Sabrevois County, Province of Quebec, 2,000 out of the 7,000 inhabitants have lately suffered from a mild type of typhoid fever. The milk and water supplies are supposed to have been the cause of the epidemic.

The bill providing for an appropriation of $35,000 for the erection of a pellagra hospital by the State of South Carolina was defeated in the House of Representatives by a vote of 31 to 23. It had already passed the State Senate by a large vote.

A supposed case of bubonic plague having been discovered in Havana on March 6, all vessels were held in port for the time by the Public Health Service. Numbers of cases of plague, with several deaths, have been reported from ports of Ecuador.

An appropriation of $5,570, equivalent to two years' salary, has been granted Mrs. McClintic, widow of the late Dr. Thomas B. McClintic, U. S. P. H. S., who died from spotted fever contracted while making investigations into that disease in the Rocky Mountains.

The Health Department of the City of New York will issue bulletins from time to time on pure food laws and the attitude of the New York Health Department. The first one of the series was issued on March 16, entitled "The Value of Public Health Education in Pure Food Work."

There will be set aside a portion of the national public health exhibit at the Panama Exposition for the demonstration and exhibition of methods used in the sanitation of the Canal Zone. Much importance should be atached to this part of the Exposition, as without these hygienic measures it is doubtful if the Canal could have been constructed.

It has been decided by the Board of Trustees of the University of Pennsylvania to require the same credits and preliminary education for candidates for the degree of Doctor of Public Health as for students entering medical courses leading to the

Digitized by Google

degree of Doctor of Medicine. This rule will go into effect at the beginning of the 1914-15 session.

A conference of the health and educational officers of the Southern States will be held in New Orleans April 24 under the auspices of the Louisiana State Board of Health. The formation of a plan for the betterment of health conditions and the eradication of tuberculosis among negroes will be especially considered.

The sanitary authorities of the Republic of Venezuela have issued rules requiring all vessels anchoring at maritime ports of the republic to attach devices to the chains to prevent the passage of rats. Connection between the vessels and the wharf is prohibited after six o'clock, and vessels must be anchored at least five meters from the wharf.

Sir David Bruce, in speaking of sleeping sickness, says that that disease is very rapid and practically always fatal in Nyassaland, no cases of recovery having been reported. A committee has been appointed to investigate the transmission of trypanosome infections among man and animals by the tsetse fly in Africa, with the hopes of finding some means to check this infection.

The London School of Tropical Medicine has sent an expedition to the East for the purpose of inquiring into the mode of the spread of trematode diseases and the relation between the infections of domesticated animals and those of man. The expedition is in charge of Dr. R. T. Leiper, who will be accompanied by Surgeon E. L. Atkinson, R. N., and Mr. Cherry Gerrard, assistant zoologist of the Scott Antarctic Expedition. The party will go first to China, investigating Blue River Valley and then Hong Kong. Later the expedition may go to the Malay States and Ceylon.

A dinner was given in London on March 23, complimentary to Dr. William C. Gorgas, who, with Dr. Darling and Major

Digitized by Google

Noble, has been investigating the sanitary condition of the Rand mines in South Africa. The guests included Sir Thomas Barlow, toastmaster; Sir Rickman Godlee, Sir Francis Champney, Sir David Ferrier, Sir Hevolock Charles, Sir William Osler, Sir Clifford Allbutt, the Colonial Secretary, Mr. Lewis Harcourt, Viscount Bryce and the officers of the medical services of the Royal Army and Navy. Dr. Darling and Major Noble were also guests of honor. The *British Medical Journal* recently referred to Dr. Gorgas as the "Hercules of hygiene."

The National Association for the Study and Prevention of Tuberculosis has recently issued a circular setting forth some of the things accomplished by the association, and some of the things yet to be done. Eight hundred state and local anti-tuberculosis societies have been formed in almost every state in the Union. Five hundred hospitals and sanatoria with over 30,000 beds; 400 dispensaries with more than 1,000 physicians and 150 open air schools for consumptive and anemic children have been established. Active campaigns have been carried on by the association in forty States and Territories, and 100,000,000 pamphlets on tuberculosis have been distributed.

Public Health Activity.

ILLINOIS.—(*Chicago School of Sanitary Instruction,* March 14, 1914.) This bulletin contains a report of forty-one cases of smallpox in Chicago since the first of the year. The last twenty-one cases were distributed as to occupation as follows: Two street car conductors, one of whom was discovered while collecting fares by a health officer riding on the car; one postoffice clerk handling daily mails; one ice-cutter; two traveling salesmen; seven clerks; three laborers; two housewives; three children. The report shows the liability of unconsciously coming in contact with persons affected with smallpox and the necessity of vaccination.

NEW JERSEY.—(*Division of Foods and Drugs of the State Board of Health.*) This Division examined 589 samples of foods and drugs during February. Of this number, which consisted mostly of pickles, canned cherries, oleomargarine, sausage, etc.,

Digitized by Google

501 were found to be up to the standard and 88 below. The percentage of drugs below standard was greater than the percentage of food below the standard.

NEW YORK.—(*Buffalo Sanitary Bulletin*, Feb. 28, 1914.) Though other cities have recently been active in investigating the common fork used at lunch counters, Buffalo was the first city to take up the investigation, Dr. William G. Bissell, Bacteriologist of the Department of Health, being appointed in 1909 to collect data on the subject. He found that these forks were used by those patronizing the free lunch counter, who ate from a common dish of food, then either stuck the fork in a glass of water or laid it down on the counter to be used by the next customer. Dr. Bissell's report is in part as folows: "The photomicrographs submitted * * * represent the following: No. 1 shows the presence of the various bacilli and of ephithelial cells which gained entrance to the water by the fork transmitting the same from the human mouth. No. 2 shows the presence of bacilli and epithelial cells from the mouth. No. 3 shows the presence of bacilli and pus cocci. No. 4 shows the presence of pus cocci from the mouth. No. 5 shows the presence of bacilli and pus cocci. No. 6 shows the presence of streptococci. There is considerable evidence that a variety of streptococci is closely associated in scarlet fever. These streptococci are usually in abundance in the mouth during the tonsilar infection of the disease. The exact variety in this instance was not determined, but in that the streptococci in this examination were undoubtedly transferred from the mouth while using the fork there is a possibility of the transmission of scarlet fever infection by this common practice." The report goes on to name several other bacteria found in a similar manner, which shows plainly that under favorable conditions there is great danger in such a common fork.

NEW YORK.—(*Buffalo Sanitary Bulletin*, Feb. 28, 1914.) The first case of the forcible detention of a consumptive has come up in Buffalo. A man of 40 years, in the advanced stages of tuberculosis, has repeatedly been an inmate at different hospitals,

Digitized by Google

but runs away each time. He has a wife and two children, all of whom live in one room, sleeping together and practicing none of the precautions provided by the Department of Health. Repeated warnings had no effect and a warrant for his arrest was finally issued. He was then confined by the judge in the Erie County Hospital, where he must obey all rules and regulations for at least sixty days. If he again disobeys the law, he will be taken before a magistrate and sent to the Erie County Penitentiary, where a proper place is provided for the isolation of such inmates. This new tuberculosis law will be of great benefit in providing for the isolation and care of those who through carelessness or the assertion of "personal rights," endanger the health of others.

NEW YORK.—The *Weekly Bulletin* of the New York City Board of Health has increased its circulation from 2,000 to 10,000 copies. This will include every physician in New York City. Quarterly reports of the health activities will be made and the tables for each quarter will be repeated for comparison.

NEW YORK.—(*Health News*, Monthly Bulletin of the New York State Department of Health, February, 1914.) The greater part of this bulletin is devoted to a consideration of smallpox and the necessity of vaccination. One article, "Smallpox and Vaccination," gives a brief but interesting history of smallpox before the discovery of protective vaccination by Jenner and traces the decline of the dreaded disease down to the present time. Among other topics discussed are the plans for the Division of Child Hygiene, the inspection of summer resorts and the question of whether or not New York shall have a Division of Rural Hygiene.

OHIO.—*Cincinati. The Weekly Bulletin* warns people of the dangers of summer resorts on account of the bad sanitary conditions, impure drinking water and the hosts of flies and mosquitoes which usually abound in such places. It occasionally happens that there are more harmful results than beneficial ones unless one is careful to ascertain the source of the water supply, etc., before deciding on a place to spend the summer vacation.

Digitized by Google

CURRENT LITERATURE

THE PRESENCE OF ACID-FAST BACILLI IN SECRETIONS AND EXCRETIONS OF LEPERS.—(*U. S. Public Health Bull.* No. 61, July, 1913, pp. 15-22.) Harry T. Hollmann in an excellent paper gives us valuable data concerning the possible transmission of leprosy exclusive of insect transmitters. Acid fast bacilli were detected in the sputum, urine, sweat and tears of some lepers suffering from cough, nodular cases, and those with lesions of the sclera, respectively. Six hundred and seventy-one examinations of feces of four nodular cases were negative. Out of 214 samples of sweat from 48 cases, acid-fast rods were found to be present eight times from six nodular cases. The organism was found in the tears of two cases suffering from sclerotic lesions. A bibliography of 34 references accompanies the paper. P. L. Querens.

ABSENCE OF LUETIN REACTION ON LEPERS SHOWING A POSITIVE REACTION. —(*U. S. Public Health Bull.* No. 61, 1913, pp. 11-14.) M. T. Clegg has found as the result of numerous observations that the confusion existing among lepers giving a positive Wassermann reaction, with the possible presence of luetic infection, can practically be eliminated by the new luetin reaction of Noguchi. The luetin reaction is made with killed spirochetæ grown artificially and injected intradermically, and an inflammatory area appears at the site of inoculation. Clegg found eleven lepers out of twenty-four which gave a positive Wassermann, but failed to respond positively to the luetin reaction. P. L. Q.

ELEPHANTIASIS, WITH A REPORT OF A CASE.—(*Jour. of the A. M. A.*, Vol. LXII, No. 12, March 21, 1914, p. 916.) James Patterson reports a case of true parasitic elephantiasis of a female patient who had never been outside the temperate zone, and it is impossible to account for the infection. As it was impossible to identify the nematode, the author suggests that it is most probably *Filaria bancrofti*, due to its preference for a human host. The case is deserving of interest on account of this infection being formerly considered of purely tropical origin. Three figures accompany and illustrate the article, showing the calcified encapsulated filaria.
P. L. Q.

THE GENERAL ACTION OF QUININ IN THE TREATMENT OF AMEBIC DYSENTERY.—(*Jour. of the A. M. A.*, Vol. LXII, No. 13, March 21, 1914, pp. 1009-1010.) Roger Brooke suggests the use of quinin as an adjunct to ipecac in the resistant cases of amebic dysentery, due to the successful results obtained by him in treating cases that failed to react favorably to emetine. While working on the hypothesis that the amebæ probably become immune to ipecac by prolonged administration ("ipecac fast"),

Digitized by Google

quinin was used as an alternating remedy with varying results. While no attempt is made to consider quinin equally as effective as emetine (its amebicidal action *in vitro* is one-fifth as great), there is no hesitation to consider it as an alternate remedy when the latter becomes ineffective. Although quinin is less effective than emetine, the dosage by far compensates for this difference of action; it is also more easily available, and the patient is less susceptible to the discomforts that follows ipecac or emetine administration. P. L. Q.

DIABETES INSIPIDUS—COMPLICATING MALARIA.—(*China Med. Jour.*, Vol. XXVIII, No. 1, January, 1914, pp. 18-19.) A. H. Patterson reports an interesting case of malaria complicating diabetes insipidus worthy of mention on account of the low temperature resulting from the intercurrent infection. Quinin was readily effective for the malaria, but due to the failure of improvement a more systematic examination was made and the presence of diabetes insipidus revealed. The condition quickly abated under the administration of ergot and codein. P. L. Q.

THE MORPHOLOGY OF THE PLAGUE BACILLUS.—(*Jour. of Hygiene.* Plague Supplement III, Jan. 14, 1914, pp. 418-422.) Sydney Rowland reports the diverse morphology of *B. pestis* as the result of observations of its growth on the following media. In broth at 20° C., they possess no capsule, though at the site of inoculation in animals the presence of a capsule can be readily demonstrated. When grown at 36°C., a capsule is visible in some of the organisms when subjected to dark ground illumination in an India ink emulsion. When grown in the various serum-containing media, the number of organisms showing capsules show a decided increase, similarly found in the spleen of rats dying from *B. pestis* infection. In some cultures the diversity of morphology varies from that of a micrococcus to a mould, etc. The envelope has been found to be soluble in dilute alkalis and disappears on the addition of fresh normal rat serum or immune horse serum when subjected to a temperature of 37°C. B. L. Q.

OBSERVATIONS ON THE MECHANISM OF THE TRANSMISSION OF PLAGUE BY FLEAS.—(*Jour. of Hygiene*, Jan. 14, 1914. Plague Supplement III.) A. W. Bacot and C. J. Martin point to the extensive work of the Commission for the Investigation of Plague in India (1906-1907), especially their observations that plague bacilli cannot be found in any part of an infected flea except in the alimentary canal. The observations of the authors coincide with those of the Commission, and they feel certain that "transmission is not occasioned through infection of the salivary glands of the insect transmitters, as in the case of malaria and sleeping sickness." They repeated the work of the Commission to determine if infection could occur through the small wounds made by flea bites. Three series of rats were prepared alike by being shaven on the belly. Three days afterward fleas were allowed to feed on the shaven area in the instance of two lots of rats,

Digitized by Google

making a ring of punctures the size of the test tube in which they were contained. To the flea bitten area in series A, slices of plague-infected spleen were applied. To series B, an emulsion of plague bacilli was applied with a pledget of cotton. To series C slices of infected spleen were applied over the shaven surface, but these rats had not been exposed to the bite of fleas. In series A, 90 per cent died in three days of plague. In series B, 22 per cent died of plague. In series C (13 rats), none contracted the disease. The experiments show conclusively that infection may result from plague bacilli deposited over skin recently bitten by fleas. Though the feces of plague infected fleas contains bacilli, the number of these is comparatively small. However, there can be no doubt but that infection can take place in this way, especially on account of the strong habit of fleas to defecate while feeding. The authors made extensive experiments to determine whether fleas could infect during the act of sucking blood. Fleas that have been starved for twenty-four to forty-eight hours seldom defecate while feeding and were therefore employed in the experiment. They were watched carefully with a hand lens and whenever one did deposit feces on the skin of the experimental animal, it was immediately removed with blotting paper and the infected area treated with a strong solution of lysol. In the first series, ten rats were fed on by an average of sixteen fleas, of which 25 per cent were found to be infected. The species of flea employed was *Ceratophyllus fasciatus*. None of the rats was infected. In another series of ten rats fed on by another lot of this same species of fleas, later examination of which showed 60 per cent to be infected, two died of plague. This showed that infection could be produced by the act of biting, "but that it by no means occurs every time a flea with plague bacilli in its stomach feeds on a susceptible animal." In still another series of experiments, only fleas were employed that had been proven to be infected by the demonstration of plague bacilli in the feces of each individual. Both *Ceratophyllus fasciatus* and *Xenopsylla cheopis* were employed. Of thirteen rats thus treated nine died of plague. While making these experiments it was observed that certain of the fleas sucked persistently and energetically but no blood entered their stomachs through their esophagi became very much distended. Upon dissecting these, it was found that their proventriculi were blocked with what proved to be solid culture of plague bacilli and their esophagi were more or less distended with clotted blood. The importance of the observation was at once recognized. Obstructed fleas can be identified by watching them while feeding and noting that they move from place to place and do not fill with blood as others do, and also by examining them under the microscope while they are placed on their side in a drop of water. One or two obstructed fleas of the species *Xenopsylla cheopis* were fed upon four rats, all of which promptly died of plague. Likewise, one or two obstructed *Ceratophyllus fasciatus* were fed upon six rats, only one of which died of plague. In further experiments *Xenopsylla cheopis* and *Ceratophyllus fasciatus* in the ob-

Digitized by Google

structed condition were allowed to puncture only once a total of thirty rats. Of this number nine died of plague. Thus is shown that with fleas in this pathological condition the chances of infection are thirty per cent. Studies of the development of plague bacilli in the alimentary canal of fleas show that they multiply and form very tough gelatinous slumps in the stomach and also in the proventriculus. Those in the proventriculus may obstruct the opening into the stomach until such time as the colony may autolize or otherwise become liquefied and pass on. Such obstructed fleas are thirsty and are persistent in their efforts to get blood. They can suck forcibly because the muscles for this function are situated in the pharynx. Such fleas thus may distend their esophagi with blood, which promptly becomes infected. The elastic recoil of the esophageal wall when the pharyngeal pump stops is likely to force back some of the infected blood into the wound in this way. It would seem that actually fleas with their proventriculi obstructed or blocked by a culture of plague bacilli are the chief source of infection to rtas. C. C. Bass.

THE TRICHONOCARDIASES.—(*Annals of Trop. Med. and Parasitology*, Vol. VII, No. 4, December, 1913.) Albert J. Chalmers and W. R. O'Farrell discuss the ihstory of trichonocardiasis and describe the disease. The disease affects the pubic or axillary hair and does not affect hair of other parts of the body. It is due to growth on the hair shaft of a fungus of the order chonocardiasis flava or in association with *Micrococcus castellani* (Chalmers Deuteromycetes, *Nocardia tenuis* (Castellani, 1911) either alone as in tri- and O'Farrell, 1913) as in *T. rubra* or with *Micrococcus nigrescens* (Castellani, 1911) as in *T. nigra*. The trichonocardiases have been known only to exist in Ceylon, Anglo-Egyptian Sudan and on the Gold Coast of Africa, and they have been supposed to be limited to low-lying, damp, tropical regions. The authors found cases in Khartoum, which has an elevation of 390 meters above sea level, at Alexandria, and during the month of May, when it was quite dry. In properly prepared specimens of infected hairs the *Nocardia tenuis* can be seen as minute bacillary forms lying more or less parallel to each other and embedded in an amorphous ground substance probably excreted by the fungus. The hyphæ are non-septate and each cell is enclosed in a cell wall. Monopodial branching occurs. *Micrococcus nigrescens* was described by Castellani on page 1521 of the second edition of the Manual of Tropical Medicine. *Micrococcus castellani*, the cause of *trichonocardiasis rubra* is named by the authors for the first time and a fairly complete description of its biological position given. An accidental laboratory infection with *Micrococcus castellani* occurred and it was possible to fix the incubation period at about two weeks before sufficient growth on the hairs of the fold of the groin to attract attention. "The fungus arriving upon the hair grows and pushes its way at first under a cuticular scale and then quickly works its passage into the cortex, raising in doing so its superficial fibres, which, together with the cuticular scale, form a covering or protection for the fungus which probably finds the nutriment it

Digitized by Google

requires in the fluids of the cortex of the hair. Once established in position, the fungus does not penetrate deeper into the cortex, but, on the contrary, grows outwards, forming the nodosities, rings and sheaths to the hair which have already been mentioned.'' None of the three varieties of trichonocardiasis produces any general symptoms. The coloration is what is first noticed. The infection disappears on return to a temperate or cold climate. A useful treatment recommended by Castellani is application of formalin, one dram to one ounce of water during the day, and application of a 2 per cent sulphur ointment at night. C. C. B.

EPIDEMIC TRICHONOCARDIASIS.—(*Annals of Tropical Medicine and Parasitology*, Vol. VIII, No. 4, December, 1913.) Albert J. Chalmers and A. D. Stirling report the discovery of forty-two cases of trichonocardiasis about the middle of September in the Welsh regiment which had been stationed at Khartoum for some months. The first patient in whom the diagnosis was made applied for treatment on account of irritation of the skin of both axillæ. Recognition of the disease in this instance led to a systematic examination of the regiment, resulting in discovery of forty-two cases in all. Most of them were *Trichonocardiasis flava*, but several cases of *T. rubra* were found. No *T. nigra* could be found. It was thought that the infection was traced to a washerman who washed in particular the shirts and khaki trousers for the men. The infected men were duly treated and a subsequent inspection revealed no new cases. The large number of cases afforded opportunity for experimentation with different methods of treatment. The best remedy appeared to be a combination of the formalin-sulphur method of treatment for about two days followed by tincture of iodine. Several cases were cured in less than a week by this treatment. Tincture of iodine alone was not efficient. C. C. B.

FREQUENCY OF FILARIA BANCROFTI IN SUBJECTS FREE FROM ELEPHANTIASIS AND LYMPHATIC COMPLICATIONS.—(*Bull. de la Soc. de Path. Exotique*, No. 2, 1914.) (Drs. M. Leger and R. Le Gallen.) The relation that exists between infestation with the *Filaria bancrofti* and the endemic lymphangitis, or elephantiasis arabum, is still a controverted question. The problem is far from being a simple one. Its solution requires the establishment of the *filarial index* of the country in which recurrent lymphangitis or elephantiasis exists endemically. Guadeloupe and Martinique offer a favorable field for these investigations, and the authors have been able to contribute some data that help fill up some of the gaps in our knowledge of the subject. The embryo of the *Filaria bancrofti* has been sought for a long time by physicians practicing in the Antilles in chylous urine or the blood. More recently, in Martinique, Dufourgeré (1907) found a cocci diplococcus, Gram-negative, in all cases of endemic lymphangitis; this disease ended in elephantiasis only in those cases that were carriers of the filaria. In blood drawn from fifty-three sufferers from elephantiasis, Dufourgeré found the embryo forty-three times, all ''dead,'' the majority

Digitized by Google

of them in a state of "debris." He identified them eleven times as *Microfilaria nocturna* and thirty-two times as *Microfilaria demarquayi*. Noc and Stévenel arrived at different conclusions. Among 4,000 Martiniquans, from 1909 to 1913, they found 88 with affections of the lymphatics (73 cases of endemic lymphangitis, 15 cases of elephantiasis.) None of the cases from whom blood was withdrawn showed any filarial embryos whether by day or night. On the other hand, among 73 individuals in apparently perfect health, the presence of *Microfilaria nocturna* was ascertained in the peripheral blood (at night) four times (5-47 per cent). The authors mention expressly that they did not find the *Microfilaria demarquayi*. In order to establish a more exact filarial index among the Guadeloupians, Leger and LeGallen examined the blood of recruits newly arrived from Guadeloupe at Marseilles. Among 150 subjects examined, 23 (or 15.33 per cent) presented microfilariæ in the peripheral circulation. These organisms were identified as the *Microfilaria nocturna*. None of them were found in blood examinations made during the daytime. The carriers of the *Filaria bancrofti* were in the hospital for various diseases, none of which was related to filariasis. Moreover, they had never before presented any signs of lymphangitis, nor voided chylous urine. They had no elephantiasic lesions. The authors observed in their slides a marked eosinophilia, but they did not make a differential blood count, since all of their subjects were carriers of intestinal parasites, which introduced a source of error. Two tables are given, one showing the relative frequency of filariasis in the French Antilles and the other (by Low) showing the same in the British West Indies. Low's table covers 1917 observations with an average infestation of 11 per cent. The figures varied from zero in Grenada to 32.8 per cent in St. Kitts. Low calls attention to the wide divergences in the figures for neighboring islands, even when the telluric conditions seem to be exactly the same. In Grenada, where the disease seems to be non-existent, the *Culex fatigans*, which is the carrier of the disease, is just as common as in other islands. The filarial index of the French West Indies is 15.33; that of the British is 11. Guadeloupe is much infested with *Filaria bancrofti, probably* more so than is indicated by the above index, for the observations were made on apparently healthy subjects from 20 to 22 years of age. If old people and invalids were examined also it is probable that the index would be higher. The practical deduction from the above is an unremitting campaign of extermination should be waged against the *Culex* (anti-larval), and that mosquito bars should be universally used.

A. McShane.

NOTE ON BERI-BERI.—In a recent meeting of the Pepper Medical Society, formed of students of the Medical School of the University of Pennsylvania, one of the members, Mr. Thomas P. McCutcheon, who spent the summer vacation of 1913 on the Labrador coast with Sir Wilfred Grenfell, presented a brief note upon beri-beri, calling attention to the recognition of the affection among the fishermen of the Labrador district within the past ten

Digitized by Google

years. He attributes the disease to the use of modern highly milled white flour as the staple diet, ordinarily accompanied by tea and molasses. Meat is a rare article of food, even the fish caught in the open season being cured and sold for the purchase of the cheaper wheat food. "Agriculture is discouraging; game is scarce and getting scarcer. Berries are abundant in the fall but hard to gather, owing to the almost impenetrable underbrush of Labrador. * * * Especially those who lead an active life are most subject to the disease. Women suffer less than the men. * * * Let an added burden be thrown on the economy, whether pregnancy, a wetting, chill, or a cold; add the squalor, dirt and bad air of one of the airtight, overheated cottages the natives live in, increased by the neglect caused by their own undermined health; and there is produced the groundwork for the disease which rapidly advances to the late stages of sensory and motor paralysis, with involvement of the heart, oedema and sometimes death."

Mr. McCutcheon notes several instances of occurrence of the affection in such relations of number, time and place as to suggest the idea that an infection is involved; and the occurrence occasionally in individuals on unquestionably full diet. If there be such infectious agency, it probably is especially effective in the state of metabolic fault from improper food. At least as a rule rapid improvement and cure follow the use of whole wheat flour, beans and peas. A. J. Smith.

Unpolished Rice and the Prevention of Beri-Beri.—(*Lancet*, Jan. 10, 1914.) H. Fraser and A. T. Stanton draw attention to their previous results with alcoholic extracts of rice polish as a curative agent, and consider that the structure of the substance which Funk isolated and named "Vitamine" cannot be regarded as settled, in as much as his conclusions were taken from various analyses and that he made no molecular weight determination. They conclude that whatever the nature of the active principle may be, its curative nature or at least that of the polish itself is established beyond a doubt and that this has amply been confirmed by experiments on fowls and experience with human beings. Further, confirmatory evidence has been obtained from the expedition of Wollaston and Kloss into Dutch New Guinea. From previous bad experiences with the Goodfellow Expedition of 1909-1911, in which the staple diet was polished rice, thirty-nine men were attacked with beri-beri with seven deaths. The last time the explorers provided themselves with unpolished rice together with a supply of the remedial agent (in what form is not stated). The expedition consisted of 204 natives, two Europeans and four Eurasians. The expedition lasted seven months and among the 204 rice-eating natives not a single case of beri-beri occurred. The daily ration included 700 grams of rice, 150 grams meat and fish (alternate days); kachang idju, 200 grams; Javanese sugar, 50 grams; coffee and tea, 5 grams, and salt, 20 grams. Two varieties of rice were used, one with a red pericarp and one with a silvery pericarp. The natives did not

Digitized by Google

object to either variety. The writers consider that for the sake of appearance the pericarp should be removed and draw attention to the false conception of its value as a preventory to the disease. The true value lies in the subpericarpal layer, the removal of which produces a rice which is so harmful. The phosphorus content of both rices was 0.54 per cent for the red and 0.79 per cent for the silvery variety, both of which are far above what is considered the safety limit, viz., 0.4 per cent, P_2O_5, which the authors demonstrated as far back as 1909. These results have been questioned, as has the rice etiology, by investigators from other parts of the world where rice is not a staple diet of native population; but for at least the Malay Peninsula, Netherlands, India and the Philippines, the close connection between rice and beri-beri has been established by competent observers. The authors suggest that systematic observations of the other diseases diagnosed as beri-beri in Nigeria and Brazil and whose prominent symptom is a polyneuritis, together with a closer examination of their etiologies, will have to be made before it can be said that they are the same a sthat known in the Malay Peninsula. They furthermore express the hope that the government will legislate in such a way as to allow only a rice containing not less than 0.4 per cent of P_2O_5,, and from which husk and pericarp have been removed, to be sold to the people. L. C. Scott.

ORIENTAL SORE IN THE AMERICAS, WITH REPORT OF A CASE.—(*Journ. of Cutaneous Diseases, including Syphilis*, V. XXII, No. 4, pp. 275-288.) In reporting a case of oriental sore, seen in Chicago and coming from South America, McEwen (E. L.) takes the occasion to review the literature of this disease, so far as American observers have discussed it. The first American cases were reported out of Brazil in 1895. More recently other cases have been found in South America, the Canal Zone and Mexico, and probably one case in New Orleans (occurring in a Central American). In the examination of smears from the ulcerated surfaces of the case reported "numerous diplococci were seen, many of them distinctly biscuit shaped, and a considerable number of them inside of the protoplasm of polynuclear leucocytes. These diplococci looked very much like gonococci, but were found to be Gram positive." In smears thoroughly examined alone six mononuclear endothelial cells were found, a little larger than large lymphocytes, in the protoplasm of which were numerous purplish-staining bodies, variable in shape and size. These were more or less elongated, with the long axis from two to four microns, and the short axis about one-half this size. The shape was, in general, oval, spindle shaped, kidney shaped, or like a cockle shell. Both agar and blood serum tubes, inoculated from the ulcerative surface, developed a diplococcuc apparently in pure culture. Even glass preparations showed cocci quite variable in size; some of them still showed a distinct biscuit shaped arrangement. On the blood serum medium, some of the cocci developed to a comparatively large size, one a rather irregular iutline. The cultures which developed aerobically were not further examined. Rather

Digitized by Google

full digest is given of all American cases and commentaries, including the work of Splendore, Darling and others in differentiating the Leishman bodies in cases confused as oriental sore and including framhesia and blastomycosis. The author concludes his most interesting and valuable review with the following summary: that oriental sore is undoubtedly of frequent occurrence in South America; that a pure type is not common, the cases usually seen being allied with yaws, blastomycosis, syphilis, etc.; that oriental sore of the mucous membranes has been reported and will probably be more and more common; oriental sore may be more than a local infection. The finding of a diplococcus of constant type by different observers, in widely separated cases and independently of each other, calls for further investigation. The occurrence of oriental sore out of Panama, its endemicity in Mexico as far north as 21.5° N. latitude, its direct importation into the United States, indicate a wider nature of the disease in this country in the near future. Dyer.

Digitized by Google

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed.

The All-India Sanitary Conference, Lucknow, 1914. On the Vitality of the Cholera Vibrio Outside the Human Body. By Major E. D. W. Greig. Calcutta: Thacker, Spink & Co. 1913.

Soochow Hospital Extras, with an Appeal for a Larger Hospital in Honor of Dr. Park's 60th Birthday.

Text-book of Medical Entomology. By Walter Scott Patton and Francis William Cragg. London: Christian Literature Society for India, 1913.

Prostitution in Europe, by Abraham Flexner. Introduction by John D. Rockefeller, Jr. New York: The Century Co. 1914.

Commercialized Prostitution in New York, by George J. Kneeland, with a supplementary chapter by Katherine Bement Davis. Introduction by John D. Rockefeller, Jr. New York: The Century Co. 1913.

BOOKS.

PRACTICAL SANITATION. By Fletcher Gardner and James Persons Simonds. St. Louis: C. V. Mosby Company. 1914.

This book is a treatise on the subject of sanitation written for the use of the busy general practitioner. For convenience it is divided into three parts, namely: Part One, Epidemiology; Part Two, General Sanitation; Part Three, Laboratory Methods. The first part deals with the sources of infection, the infectious diseases, isolation and quarantine and disinfection in regard to the infectious diseases. These are handled in detail and in a concise manner. The second part deals with general sanitation. Under this head the following are discussed: laying out and maintenance of isolation hospitals; organization and detail duties of health boards and list of records necessary to be kept by such boards; campaigns for the control and extermination of disease. The third part deals with the laboratory work necessary for the control of infectious diseases. The specimens necessary and their method of collection, with a test to be applied to each specimen, are mentioned in detail. The subject of typhoid fever is not complete, for the Bass-Watkins test is not mentioned. This in the hands of the average physician has been found to be of great benefit because of its simplicity, accuracy and rapidity, being more rapid and just as accurate as the Widal. R. E. Graham.

Digitized by Google

DIAGNOSTIC METHODS. By Herbert Thomas Brooks. Second edition. St. Louis: C. V. Mosby Company. 1914.

This is "a guide for history taking, making of routine physical examinations and the usual laboratory tests necessary for students in clinical pathology, hospital internes, and practicing physicians." Nine of the 68 pages of the text are devoted to history taking and physical diagnosis. The remaining 59 pages are devoted to laboratory diagnosis. There is more or less discussion of the interpretation of the results of laboratory tests, but the indications of history or physical findings are not discussed. The author very properly gives only "the up-to-date and absolutely reliable laboratory tests," but unfortunately many of them are given so incompletely that one unfamiliar with laboratory diagnosis would be unable to make them if his only guide was the present work. So many things are treated, though briefly, that space is not available in the small book to treat extensively enough for practical purposes the subjects of great importance. Take, for instance, the examination of stools for ova of intestinal parasites, a very important part of laboratory diagnosis, especially in the South; all of the description of the seven different ova mentioned takes up only about three-fourths of a page. There are a good many inaccuracies throughout the work, and its value is very much reduced by the practically total absence of pictures. Regardless of its many faults, the book will no doubt often be found useful to those who possess it, especially for the purpose of reminding them of things which they have once learned but have forgotten for the time being. C. C. Bass.

$RINCIPLES OF HYGIENE: A Practical Manual for Students, Physicians and Health Officers. By D. H. Bergey, A. M., M. D. Fourth edition. Philadelphia and London: W. B. Saunders & Co. 1912.

We are pleased to note the appearance of this revised and new edition of Bergey's Hygiene, now long standard as a text-book. More than this, it will serve as a handy manual for the health officer in the field, for aside from the principles of hygiene, set forth in fine detail, there are many chapters devoted to the practical application of methods employed in public health practice. A comprehensive presentation of quarantine laws and of vital statistics concludes the book. Dyer.

TRANSACTIONS.

The Transactions of the American Society of Tropical Medicine for the year 1913 has appeared. It contains 197 pages and nine plates.

TRANSACTIONS OF THE AMERICAN CLIMATOLOGICAL ASSOCIATION FOR THE YEAR 1913. Vol. XXIX. Philadelphia.

The last proceedings of this scientific body demand especial attention on account of the valuable papers read and discussed by America's most prominent specialists on diseases of the respiratory tract, while other mala-

Digitized by Google

dies of the thorax were not neglected, among which are included asthma, "auricular flutter," hemoptysis traceable to cardiac trouble, and tonsillar affections in relation to tuberculosis. Among the papers read and deserving of special mention are "On the Auscultatory Determination of Early Pathological Changes in the Lungs," by Henry Sewall; "The Anatomic Causes for the Differences in the Physical Signs over the Upper Lobes of the Lungs," by G. W. Norris; "The Early Lesions of Tuberculosis in the Lungs," by P. K. Brown; "The Recognition of Early Changes in the Larynx in Tuberculosis," by W. E. Casselberry; "The Role of Physical Exercise in the Open Air in the Prophylaxis of Tuberculosis," by J. M. Anders; "The Two Most Important Factors in the Prevention of Tuberculosis," by de Lancey Rochester; "A Report of Seventeen Cases of Pulmonary Tuberculosis Treated by Artificial Pneumothorax," by H. L. Barnes and F. T. Fulton, and "The Influence of Smoke on Acute and Chronic Lung Infections," by W. C. White and Paul Shuey. Other articles included discussions on mineral springs, climatic advantages of seaside localities, relation of the laboratory to the clinic, mediastinal tumors simulating tuberculosis infiltrations, and the influence of tuberculin injection on the eosinophilic count. P. L. Querens.

MEDICAL AND SURGICAL REPORTS OF THE EPISCOPAL HOSPITAL (Philadelphia). Volume 1. Press of Wm. J. Dornan, Philadelphia.

Aside from the economic value of such reports, the publication of a group of scientific papers under the impress of the hospital from which they have emanated means much in establishing the relation of the hospital to medical education. It also reflects the organization of the staff for work of a higher class then mere service. The articles contained in this report are all valuable and they deal with many subjects, among which may be noted the "Antitoxin Treatment of Tetanus," E. E. W. Given; "The Rational Treatment of Tetanus," A. C. Ashhurst and R. L. John; "Clinical Significance of Extreme Degrees of High Blood Pressure," G. M. Preisol; "The Treatment of Fractures of the Forearm," Ashhurst and John; "Pseudo-glioma in Children," F. Krauss; "Puerperal Eclampsia," W. E. Parke; "Vaccination and Its Discoverer," T. R. Carnie; and many others. Dyer.

REPRINTS.

CHALMERS, ALBERT J., and O'FARRELL, W. R. The Trichonocardiases. Reprinted from the *Annals of Trop. Med. and Parasitology*, Vol. VII, No. 4, December, 1913.

CHALMERS, ALBERT J., and STIRLING, A. D. Epidemic Trichonocardiasis. Reprinted from the *Annals of Trop. Med. and Parasitology*, Vol. VII, No. 4, December, 1913.

Digitized by Google

CLOUD, R. E. Case of Amebic Dysentery Treated with Emetine Hydrochloride. Reprinted from the *Jour. of the A. M. A.*, November 22, 1913, Vol. LXI, p. 1899.

MCDILL, JOHN R. Philippine Islands Medical Association. President's Annual Address.

O'FARRELL, W. R. Hereditary Infection, with Special Reference to Its Occurrence in *Hyalomma aegyptium* Infected with *Crithidia hyalommae*. Reprinted from *Annals of Trop. Med. and Parasitology*, Vol. VII, No. 4, December, 1913.

PRINTED AT THE TULANE UNIVERSITY PRESS, NEW ORLEANS, U. S. A.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CHARLES CHASSAIGNAC, M. D.
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine
JOHN M. SWAN. M. D., Secretary, American Society of Tropical Medicine } *Ex officio.*
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M. D., University of Pennsylvania
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. MAY, 1914 NO. 11.

EDITORIAL

Chronic Bacillary Dysentery.—Dr. Leonard Rogers, of Calcutta, writes a very instructive article on chronic bacillary dysentery in the *British Medical Journal,* reproduced in the *China Medical Journal.* He says that the treatment of this form of dysentery is in a very unsatisfactory state, especially as compared with the formerly intractable amebic variety of the disease.

Acute bacillary dysentery yields to serum and saline treatments, and the disease is subdued before much damage has been done; but when extensive ulceration has occurred, the case is much more difficult to deal with. The saline treatment ofttimes does more harm than good; in one hospital in Calcutta, the mortality from this disease is 40 per cent. In fact, no other tropical disease, except kala-azar, is more difficult to handle. Dr. Rogers has not had the good results with Shiga dysentery vac-

Digitized by Google

cines that other observers report. He has occasionally had good results from the use of an autogenous dysentery vaccine, but this is not available for general use on account of the lack of laboratory facilities.

Dr. Rogers has made more than a hundred autopsies in Calcutta in the last twelve years. These autopsies bring out in strong contrast the character and distribution of the lesions in acute and chronic fatal bacillary dysentery. In the acute form, the whole length of the large intestine and the lowest part of the ileum are uniformly involved in a fibrinous inflammation of the mucous membrane, with only superficial ulcerations, if any. Death results early from the intense toxemia and the shock induced by the large extent of mucosa involved. In the chronic form, on the other hand, the lesions are nearly always limited to the lower portions of the large intestines. The character of the lesions is different from that of cases in which ulceration supervenes earyl in the attack. In chronic cases, there are extensive, depressed ulcers, often serpiginous, in a thickened intestinal wall, with small islets of remaining mucosa between them.

The very frequent limitation of the lesions of chronic bacillary dysentery to the lower half of the large bowel, as opposed to the general involvement in acute fatal cases, was new to Dr. Rogers. It served a useful purpose in pointing out the direction in which remedial measures would be most effective. Drugs given by the mouth have to traverse the whole length of the gastro-intestinal tract down to the lower part of the colon before reaching the seat of the disease. When they do arrive in the descending colon and sigmoid, the irritability of the mucous membrane does not allow them to remain long in contact with the diseased surface before being expelled with the stools. Little is to be expected from medicines given by mouth, except bismuth in large doses.

Digitized by Google

Dr. Rogers meets a practical difficulty at the outset, and solves it satisfactorily. How is the practitioner who has no laboratory facilities going to distinguish between chronic amebic dysentery and chronic dysentery? By a simple clinical test, using emetine. When one grain of emetine, given hypodermically once a day for four consecutive days, fails to influence the course of a chronic dysentery, we know that the amebic form can be eliminated from the diagnosis, and the case be set down as one of chronic bacillary dysentery, in the absence of rarer forms of bowel disease.

The very localization of the lesions, while inimical to oral medication, renders enemata peculiarly useful, since the lower half of the large bowel is much more easily reached in this manner than the upper half. Knowing, then, how best to reach the diseased area, the question is narrowed down to the choice of remedies. Nitrate of silver has been widely used; but it has two serious disadvantages: 1st, it is precipitated by the chlorides and albuminoids found in the contents of the inflamed bowel; and 2nd, when used in sufficient quantity to be effective after this precipitation, it is apt to be very painful. These considerations led Rogers to undertake an investigation with a view to ascertaining the substances most likely to be useful when administered in enema. He tested clinically and in the laboratory the following substances: silver gelatose (albargin), nargol, protargol, mercurol (mercury nucleinate), argentamin, collargol, ichthargan, argyrol, cyllin, iodine, izal, lysol, permanganate of potash, quinine bisulphate, and boracic acid. Each substance was tested with Shiga's bacillus in two sets of dilutions—one dissolved in water, and the other in which half the diluting fluid was sterile broth containing both chlorides and albumins. The importance of the second set will be evident from the fact that whereas silver nitrate destroyed the bacillus within five minutes, up to a dilution of 1 to 10,000, yet in the presence of a little

Digitized by Google

broth it failed to kill in a dilution of 1 to 100 in one experiment, and 1 to 500 in another, being at once precipitated by the broth.

The clinical histories given by Rogers are a revelation of the value of organic silver compounds by the bowel in this class of cases. No details are given as to diet.

A. McShane.

Treatment and Teaching of Syphilis.—With the development of newer therapy in syphilis, the review of older methods has been undertaken, with wide variation of opinion as to the comparative value of one or another practice. It is certain that the exploration of the initial claim for salvarsan as a one-dose cure for syphilis or as a sterilizant of supreme office has successfully revived the consideration of the usage of other forms of arsenic previously employed, as well as of the more potent forms of mercury.

To put the matter plainly, a much belated attention was called to the prevailing ignorance among physicians generally in the care and treatment of syphilis. Specialists in syphilis, students of the subject and those familiar with the modifications of treatment in the variants of the disease, were not embroiled in the discussion; they rather engaged in the academic discussion of the merits of the new and older methods.

We are not yet at that stage of conclusions to permit a final opinion, but there are few who practice with syphilis, who to-day depend on salvarsan or its modifications alone. More than this, the accredited method and technic are not uniform, as some use large doses, other small doses frequently repeated, while yet others use quite small doses quite frequently given over long periods.

Additional and supplemental treatment with mercury and iodids is the more customary practice now even among those who are enthusiasts in the use of the Ehrlich arsenic salts.

Digitized by Google

The usefulness of the newer method of syphilis treatment is not now questioned by many; it seems to meet particular indications in acute types of syphilis as well as in intractable chronic cases. More than this, in late syphilis, involving the nervous system, it is gaining ground as a possible salvation. But of more value than most of these suggestions is the direct influence the newer therapy has had in creating a wider study of all stages and all phases of syphilis. The doctor at the crossroads must read and learn of the conclusions of wiser and better practiced men than he, and the direct effect has been for a more intimate acquaintance with the mode of treating a disease which he formerly dismissed with an almost criminal neglect. The reflex has already created an unrest among adherents of the doctrines of syphilis, embracing the teachers in medical schools particularly.

The student in most medical educational institutions has gathered his knowledge of syphilis from a number of sources, usually depending upon the incidental discussions arising in the several chairs engaged in the curricular schedule. The coordination of all phases seldom prevailed, although in most schools of grade, systematic instruction of some sort was given by the instructors in venereal diseases, in dermatology or in surgery, as the hours in each subject permitted. Some colleges, few in number, have carried a separate chair of syphilis for many years. Now the question has proven acute and various suggestions have arisen as to how syphilis should be taught. Corlett (in the February, 1914, number of the *Journal of Cutaneous Diseases, including Syphilis*) takes up the question and provokes discussion by his presentation, which makes no pretense of either comprehensiveness or detail.

He submits that: Syphilis should be held as one of the diseases the knowledge of which should be essential to graduation. Syphilis should not only be given a place as a distinct and sep-

Digitized by Google

arate subject on the schedule, but the systematic teaching should be confined to the department under the head of syphilis.

Syphilis is not a surgical subject, and it is too important to be appended to the field of the genito-urinary surgeon or to any other department of medicine or surgery.

The diagnosis and treatment of syphilis of special organs should be relegated to such divisions. Syphilis should not be a side issue and its identity should not be lost by being taught by the occupants of various chairs.

Hospitals should provide syphilitic wards in which all cases of this disease should be congregated.

With the above we must indubitably concur in the general proposition that syphilis should be emphasized by a separate chair on the subject, in which the systematic presentation of the disease should be undertaken; also a proper importance should be given to such teaching in the arrangement of the college schedule. There we stop. Syphilis is too broad a subject for the grasp of one expounder, no matter how honest his intention nor how wide his training. He can only discuss the subject in gross and must leave special detail to the teacher better trained than himself in differential diagnosis.

The teaching of syphilis should be curricularized so as to embrace all the divisions of a medical school in any way related to syphilis. The head of the department of syphilis should arrange a schedule so constituted as to allow each teacher to emphasize his point of view—laboratory or clinical. The dermatologist, the neurologist, the psychiatrist, the pediatrician, the internist, the eye, ear, nose and throat man, should each be assigned in turn. Even then the head of the department would find ample scope for instruction in the history, theory, diagnosis, semiology, hygiene and treatment of the disease.

There is no disease more vital in modern society and the former neglect of instruction to students in medical colleges

Digitized by Google

should be compensated hereafter by a wider interpretation of the subject—from all points of view.

Isadore Dyer.

Anti-Typhoid Vaccination an Established Measure in Preventive Medicine.—Whenever new measures for treatment, control or prevention of a disease are introduced they must always be accepted wtih more or less doubt until they have been carefully tried out. The doubt must be removed by impartial and usually extensive trial and observation. Before the measure becomes established the results of such trials and observations must be so overwhelmingly in its favor as to establish its value beyond any reasonable doubt. Perhaps no measure in preventive medicine introduced during the past ten years has more fully met these requirements than vaccination against typhoid. During the past six years the United States army has, in the most thorough manner, demonstrated the protective value of anti-typhoid vaccination on a very large scale.

Anti-typhoid vaccination was offered to volunteers in the army during the year 1909, but was made compulsory for all under 45 years of age in 1911. Only a portion of the enlisted men were vaccinated during the years when it was voluntary. During 1907 and 1908, just before vaccination began, there were 237 and 239 cases of typhoid fever respectively. The ratio per 1000 of mean strength was 3.20 in 1908, the best record ever obtained by sanitary measures alone. This is in very striking contrast to the occurrence of three cases and a ratio of .03 per 1000 for the entire army in 1913.* The incidence of typhoid has been reduced to less than one one-hundredth of what it was before vaccination was established.

*Russell, F. Anti-typhoid Vaccination in the Army during 1913. *Journ. A. M. A.*, May 2, 1914.

Digitized by Google

Actually the figures are better than those given above if we consider that two of the three cases of typhoid that did occur in 1913 were infected prior to enlistment and developed the disease immediately afterward. The mean strength of the army both at home and abroad during 1913 was 90,648, all of whom according to the regulations had been vaccinated. Barring the two cases infected before vaccination, in this army of more than ninety thousand men there occurred only one case of typhoid and that in China. The facts gain in weight when it is appreciated that about one-third of this large number of men were stationed in countries other than the United States proper. It also included native soldiers who quite likely do not generally appreciate and carry out sanitary measures as well as those native of the United States. It could hardly be thought that they were not often exposed to infection.

The death rate from typhoid fever per 100,000 population in the registration area of the United States during the year 1912 (the last report available) was 16.5. The absence of a single death from typhoid in the nearly 100,000 officers and men of the army who were protected by vaccination contrasts favorably with the 16.5 deaths per an equal number of the general population.

Since the very great and almost absolute protective value of anti-typhoid vaccination has been proven, the fact should be promptly accepted by the medical profession, who should encourage its acceptance by the public by example, but, especially, by expression of absolute confidence. A doctor should no more question the value of anti-typhoid vaccination than he should question vaccination against smallpox or mosquito transmission of yellow fever or malaria.

Though sanitary measures have no doubt led to considerable reduction in the prevalence of typhoid and should by all means be continued with increased vigor, it may well be thought that the reduction of typhoid to a minimum or its final eradi-

Digitized by Google

cation from a community, people or country may depend upon vaccination. This method of control or eradication would appear to have considerable in its favor over other methods because in addition to being vastly more efficient it does not permit the development of a race of people more susceptible to destruction by the disease should it be extensively introduced.

C. C. Bass.

Digitized by Google

ORIGINAL ARTICLES

THE INFLUENCE OF EXPERIMENTAL TRYPANOSOMIASIS UPON THE BODY TEMPERATURE OF WHITE RATS.

By

L. W. GRAHAM and R. H. HUTCHISON,
From the Laboratory of Zoology and the Pathological Laboratory, University of Pennsylvania.

Introduction.

The effect of trypanosome infections upon the body temperature of many animals has been frequently reported. In the majority of cases, however, extended observations of this kind have been made upon large animals in which the body temperature is normally maintained at a fairly constant level, thereby rendering the detection of increased temperature a comparatively easy matter. Laveran and Mesnil[2] briefly note the influence of trypanosomiases upon the body temperature of small laboratory animals, but such records, made with an ordinary clinical thermometer, do not seem very reliable when it is considered that the normal amount of temperature fluctuation occurring in small mammals escapes detection by the instrument of measurement employed. No attempt, so far as we have been able to ascertain, has been made to study, by means of delicate, short-interval observations over a considerable period of time, the influence of trypanasome infections, or for that matter any other kind of infection, upon the fluctuation of body temperature in small laboratory animals. Such investigation would seem to be of greater importance even in higher mammalian forms, including man, than the mere recording, at long intervals, of an increase or decrease in body heat; for in larger animals there is possibly a great deal more fluctuation in temperature than the clinical thermometer shows. In small laboratory animals, whose body temperature is not maintained at so constant a level as that of higher forms, a study of thermal fluctuation by means

Digitized by Google

of an instrument instantly responsive to changes in temperature is imperative for any accurate knowledge of temperature conditions in disease.

All that could be found with regard to the temperature of rats after infection with trypanosomes was the statement by Laveran and Mesnil that two rats infected with *T. brucei* showed no rise in temperature. Since the white rat is widely used as a subject for experimentation, it was decided to verify Laveran and Mesnil's statement concerning the temperature of rats after trypanosome infection, and to extend the investigation to include a study of temperature fluctuations before and after infection with different species of trypanosome.

Although considerable fluctuation of temperature was to be expected in the rat when its body heat was measured by a delicate thermo-electric method, we were not prepared by anything previously read concerning temperature regulation in the rat for the great range of fluctuation that actually occurs under normal and particularly under abnormal conditions of external temperature. The temperature of the albino rat has not been investigated extensively, so far as an accurate measurement of thermal fluctuation is concerned. In Schaeffer's Physiology we found the following observations upon the temperature of the rat: the average body temperature of four rats, based upon sixteen observations by Pembrey, is 37.5° C. (99.5° F.); that of two rats, based on sixty observations by Pitts, is 37.96° C. (100.3° F.). These results were obtained by measuring the rat's temperature at long intervals by means of the mercurial thermometer, and hence does not furnish reliable data with which to make a comparison of results obtained by thermo-couple for infected rats. It was therefore found necessary to determine the normal range of temperature in healthy rats before making any observations upon these animals after infection. It was well that this was done, for in measuring the temperature of healthy rats considerable variation was found between the temperature curve of any two individuals under the same conditions of external temperature. Thus it is apparent that the average of observations on a number of different animals forms an unreliable basis for comparison with other rats infected with a

Digitized by Google

disease, even if the observations on the healthy animals were made with a thermo-electric apparatus. The results of these experiments show that in the healthy rat under normal conditions of temperature there is considerable fluctuation of body temperature.

The experiments carried on in the course of this investigation were planned with the object of ascertaining the rat's normal relation to three conditions of external temperature, and the noting what variation from the normal range of fluctuation occurred after infection. Although the animals placed at ordinary external temperature might show no variation after infection, those placed under abnormal external conditions of heat and cold might prove less resistant to infection, which might then manifest itself in a rise or fall of, or a greater range of fluctuation in, body temperature.

Method.

The thermo-electric method for temperature measurement employed in these experiments is the most improved of its kind now in use. The apparatus, including potentiometer, d'Arsonval galvanometer and thermo-couples, was put at our disposal by Dr. E. F. Philips and Mr. George S. Demuth of the Department of Agriculture, now working in the Zoological Laboratory of the University of Pennsylvania. The thermo-electric method is briefly as follows: When a circuit is made of two metals a current of electricity is generated, if the two junctions are of different temperatures. The strength of the current varies with the difference in temperature and with the metals employed. In this work fine wires of copper and Constantin are employed, in which case a current of approximately 40 microvolts is generated for each degree Centigrade, or the difference in temperature between the two junctions. One junction was kept constantly at 0° C. in a thermos bottle filled with ice. The apparatus used, consisting of potentiometer and d'Arsonval galvanometer, was manufactured by Leeds and Northrup of this city. With the use of the potentiometer the length of the wires and the consequent difference in resistance is immaterial since this instrument measures electromotive force rather than current. For

NOTE.—While this paper was in manuscript the report of an investigation by F. B. Sumner upon "the effects of atmospheric temperature upon the body temperature of mice" appeared in the *Journal of Experimental Zoology* for Oct. 5, 1913. In this investigation the instrument of temperature measurement employed was the mercurial thermometer, which is not the most desirable means for studying body temperature.

Digitized by Google

more detailed information concerning the use of thermocouples in temperature measurement the reader is referred to works on physics. The method is accurate to one-tenth of a degree centigrade. The use of these instruments in certain special cases is to be discussed in a paper soon to be published by Dr. Phillips and Mr. Demuth.

In the course of this investigation three experiments were performed. The thermo-couples for measuring body temperature were inserted in the rectum of the rat to a distance of four centimeters and held in position by a strip of adhesive plaster firmly wrapped around the base of the tail. It was found that a considerable amount of variation in the distance to which the couple was inserted caused a corresponding variation in temperature readings. When a couple slipped down the rectum in the course of experiment, readings on the potentiometer fell abruptly, so that it was an easy matter to detect the slipping of a couple and replace it. Since variation in the distance to which the couples were inserted caused variation in readings there was the possibility that more or less variation in temperature might occur between larger and smaller rats, for in the smaller rat an insertion of four centimeters would carry the couple relatively farther up the rectum than in a larger rat. It was found after a number of observations that such variation did not occur. In some cases the larger rats had a higher temperature than the smaller rats, which is the reverse of what would occur if there were any direct relation between the size of the rats used and the distance to which the thermocouple was inserted.

Readings of body temperatures were made at short intervals over a considerable period of time before infection under three different conditions of external temperature, in order to determine the normal thermal fluctuation under these conditions. The three different external conditions were room temperature, warm constant temperature 37.0° (98° F.), and refrigerator temperature. Having found the temperature fluctuation in healthy animals under these external conditions, similar readings were again made from the same animals after infection. In the first experiment, a series of twenty-four-hour readings every fifteen minutes were made before and after infection. In

Digitized by Google

the second and third experiments, twelve-hour readings every ten minutes were made on the day before infection, and for as many days after infection as the animal lived, or for as long as seemed necessary to show the influence of trypanosomes.

Prolonged conditions of external heat were obtained by means of a warm constant temperature room which was kept at approximately 37.0° C. or 98° F. The delicacy of the potentiometer for detecting variations in temperature is well illustrated by the curve representing readings of the temperature of this room (see chart 6). These variations are of a considerable amount, in one case amounting to 2.9° C.; but, just as in the rat, they occurred so quickly as to escape registration by the mercurial thermometer.

Conditions of prolonged cold were obtained by using an ordinary refrigerator with a capacity of 50 pounds of ice. The temperature of the refrigerator is represented by the curve so noted on chart 5. At times the temperature in the refrigerator rose too high, but was reduced as soon as possible by the addition of more ice.

The trypanosomes used in these experiments were for the most part pathogenic. In the first experiment a non-pathogenic form, *T. lewisi,* was used to show what difference in effect upon the body temperature might occur between a pathogenic and a non-pathogenic form.

The problem of keeping the couples in place in the lower intestine during readings was of first importance; for if this could not be accomplished the results of experiment would be unreliable. In order to obtain this constant condition it was at first thought necessary to curtail the movements of the rat as much as possible. Accordingly, in the first experiment, a wire cone was used of diameter sufficiently small in each case to prevent the rat's doubling up inside of it. The ends of the cone were stopped with cotton, thus preventing escape. Such restraint of the musculature served its purpose well enough for rats placed at room temperature and for those placed at 37.0° C. (98° F.) in that the conducting effect of the wire mesh around the animal was not sufficient to vitiate results in the majority of cases. In those rats placed in the cold, how-

Digitized by Google

ever, the influence of the wire cone holder in preventing temperature regulation by its restraint upon muscular movement introduced an abnormal factor. In the first experiment the animals placed in the cold were under the same condition of restraint both before and after infection, but nevertheless the abnormal effects of the wire mesh holder, in the cold, might render the influence of trypanosomes on thermal regulation less obvious. Since it was necessary to prove whether results obtained with the wire holders were reliable under any one of the conditions of external temperature, they were dispensed with for all rats under all three conditions of external temperature. It was found that when the wire mesh did not press the animal tightly there was no interference with thermal regulation in rats at room temperature and in the warm room. On the other hand, considerable difference was observed between the thermoregulatory power of rats placed in the cold with wire holders around them and rats so placed without the holders. Rats permitted the freedom of separate cages in the cold were able to maintain a much more constant level of body temperature than those confined in the holders, as will be seen by comparing charts 2 and 3 with charts 5 and 7.

In permitting the rats the freedom of separate cages in the second and third experiments it was necessary to lengthen the wires leading to the couples and to protect and strengthen them by a thick wrapping of tire-tape over that portion of them that ran into the cages. This prevented the wires from catching and pulling out the couples and thus breaking the circuit. It was hence necessary to restrain the jaw muscles of the animals in some way. At first a muzzle of adhesive plaster was used, but the animals soon or later were able to work this off, so that it was necessary to gag them during experiment. So far as could be observed, the gags caused the rats little or no discomfort after having been in place for some time. During experiment the animals were given water at regular intervals by means of a pipette. The rats in the warm room required water frequently and this was given.

A table will briefly describe the arrangement of rats before

Digitized by Google

and after infection under the three different conditions of external temperature in the three experiments:

Experiment I.

Rats placed at room temperature:	R156, inoculated with *T. equinum*
	R157, inoculated with *T. evansi*
	R158, inoculated with *T. lewisi*
Rats placed in refrigerator:	R153, inoculated with *T. equinum*
	R154, inoculated with *T. evansi*
	A154-A, inoculated with *T. evansi*
	R155, inoculated with *T. lewisi*
Rats placed in warm room:	R150, inoculated with *T. evansi*
	R159, inoculated with *T. evansi*
	R151, inoculated with *T. lewisi*
	R160,.....

During experiment R154-A was substituted for R154, and R159 for R150. R160 died during readings before infection. In this experiment readings were made every fifteen minutes for a period of twenty-four hours before infection, and for the same period after infection, when the trypanosomes had become virulent.

Experiment II.

Rats placed at room temperature:	R167	
	R168	
Rats placed in refrigerator:	R169	All inoculated with *T. evansi*
	R170	
Rats placed in warm room:	R171	
	R172	

Experiment III.

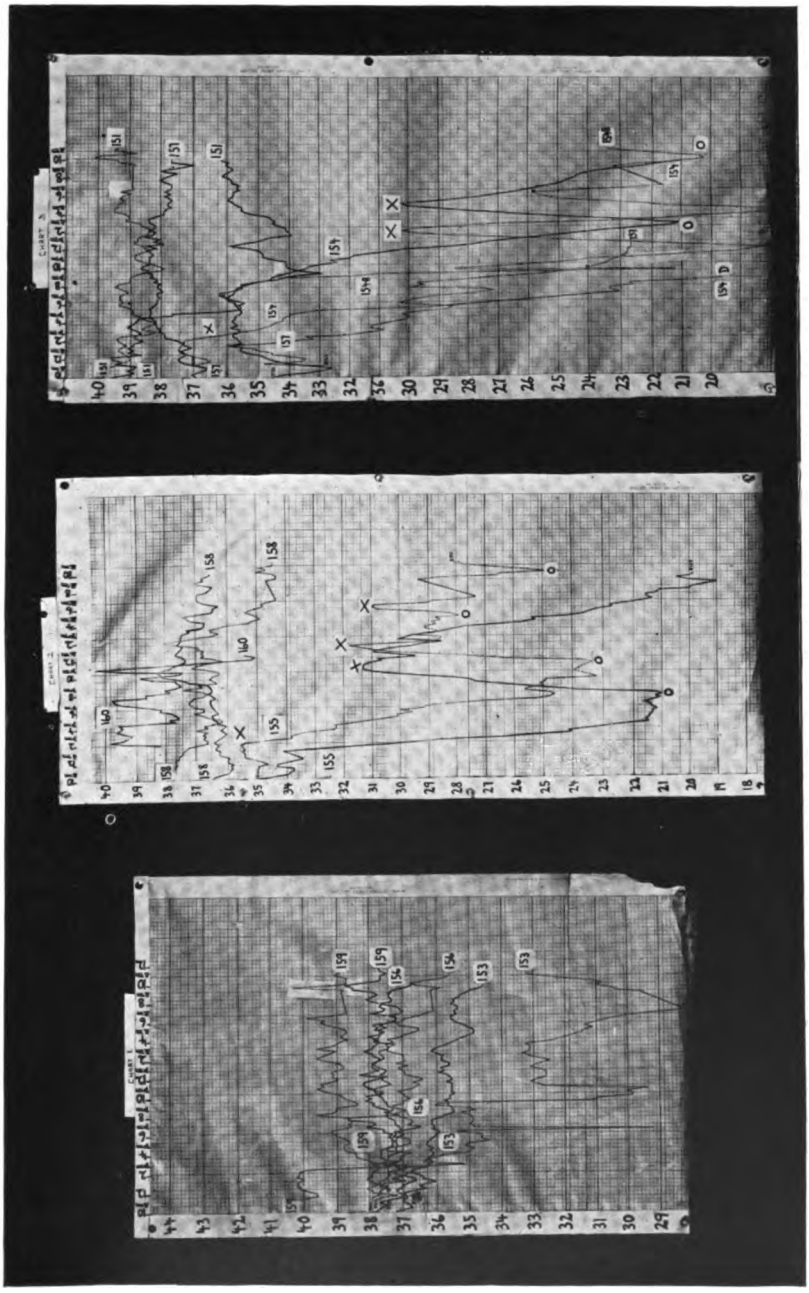
Rats placed in refrigerator:	R180, uninfected
	R181, uninfected
	R182, uninfected
	R178, inoculated with *T. brucei*

In experiments II and III the temperature of surroundings was taken by thermocouple. Twelve-hour readings at ten-minute intervals were made on the day before infection and continued after infection.

Results.

The highest body temperature that was observed for uninfected rats placed at room temperature was 38.7° C., and the

Digitized by Google



INFLUENCE OF EXPERIMENTAL TRYPANOSOMIASIS GRAHAM AND HUTCHISON

Digitized by Google

Digitized by Google

lowest 32.4° C., giving a range of fluctuation of 6.3° C. under normal external conditions. If the average of all the readings made on rats placed at room temperature should be taken, it would furnish little idea, however, of the actual thermal conditions in the rat's body in a healthy state. Such can be obtained only by presenting the data from each rat in the form of a curve that shall represent the temperature taken at short intervals over a considerable period of time. Observations on the effect of disease upon the body temperature of the rat, when made by the rough method of the ordinary mercurial thermometer, at daily or hourly intervals before and after infection, is of little value owing to the great fluctuation that normally occurs, which can be measured only by an instrument instantly responsive to changes in body temperature. In other small laboratory animals there also probably occurs considerable fluctuation that escapes the mercurial thermometer. In higher animals and man this is also doubtless true.

The temperature of healthy rats under abnormal external conditions is a matter worthy of special mention. The amount of thermal fluctuation in body temperature without fatal effect in rats placed in the refrigerator is rather remarkable. In one case (R154, chart 3, table 3) a healthy rat under the influence of cold fluctuated 15.0° C., the highest reading being 36.1° C. and the lowest 21.1° C. In another instance (R155, chart 2, table 3) of a rat placed in the cold, the temperature fluctuation amounted to 15.9° C., the highest reading being 34.9° C. and the lowest 19.0° C. When the temperature dropped very low the rat was removed to prevent possible death. When taken out of the refrigerator, rats removed on account of their low body temperature were in a lethargic state, and it was some time before they returned to a normal condition at room temperature. It is noteworthy that recovery from such a low body temperature as 19.0° C. is possible. The curves of body temperature of rats placed at 37° C. (98° F.) show a reversion, more or less complete, to the cold-blooded or poikilothermic condition, as described by Tigerstedt.[2] On examination of these curves (see chart 6, R171 and 172) it will be noticed that they are in close proximity to the curve representing the temperature of

Digitized by Google

the warm room. It will also be seen that in many instances the curves of rat temperature rise or fall with that of the warm room. According to Tigerstedt,[2] warm-blooded animals, when exposed to excessive heat or cold for some time, lose their power of thermal regulation, reverting to a more or less cold-blooded condition, with the result that their heat production rises and falls along with the external temperature.

The highest reading for uninfected rats placed in the warm room is 41.8° C., and the lowest 32.9° C.

The Effect of the Different Species of Trypanosome Used in This Investigation Upon the Body Temperature.

As will be apparent by consulting the curves of the same rat before and after infection, there occurred no marked rise in temperature after infection with any species of trypanosome. This agrees with the statement made by Laveran and Mesnil, who found no rise in temperature in two rats infected with *T. brucei*. In experiment 1, of the rats placed at room temperature and of those put in the warm room, some show a slight rise after infection and others show a fall (see chart 1, R156 and R159; chart 2, R158; chart 3, R151 and 157). In experiments II and III this rise did not occur in rats after infection under any condition of external temperature (see chart 4, R167 and 168; chart 5, R169 and R 170; chart 6, R171 and R172). The evidence as presented by the temperature curves seems conclusive that no fever is produced in white rats by pathogenic or by non-pathogenic trypanosomes.

The fact that there occurred no rise in temperature after infection is not proof, however, that the infection influences body-heat production in no way whatever. As to the effect of trypanosomes upon thermal regulation as shown by the range of fluctuation in body temperature, general statements, based upon the evidence of the charts and tables, are arranged under the following headings.

Digitized by Google

1. The Effect of Inoculation with T. lewisi Upon the Body Temperature of White Rats.

Readings made on three rats under three different conditions of external temperature respectively furnishes evidence showing that *T. lewisi* has little or no influence upon the thermo-regulatory mechanism. In support of this statement the following data are submitted:

R155 (chart 2, table 3), placed in the refrigerator, fluctuated over a range of 15.9° C. before infection. After infection the range of fluctuation amounted to 12.4° C. In this case there was more fluctuation before infection than afterwards. The wire mesh holders probably conduced to this excessive drop in temperature before and after infection.

R158 (chart 2, table 1), placed at room temperature, fluctuated 2.5° C. before infection. After infection the range of fluctuation was 3.6° C. An increase of but 1.1° C. after infection does not seem to be significant of trypanosome influence.

R151 (chart 3, table 2), placed in the warm room, showed little ability to regulate temperature under the stress of prolonged heat before infection, the range of fluctuation amounting to 6.9° C. After infection, however, this rat recovered from the depressive effect of the heat, for the range of fluctuation was only 2.2° C. This seems rather conclusive that *T. lewisi* has no effect upon thermal regulation, since it did not interfere with thermal readjustment in this rat.

2. The Effect of Inoculation with T. equinum Upon the Body Temperature of White Rats.

Observations made upon two rats, one of which was placed at room temperature and the other in the refrigerator, warrant the conclusion that thermal regulation was unaffected by this species of trypanosome under normal external conditions, but that thermal regulation was affected under prolonged conditions of cold. The evidence for this statement is as follows:

R153 (chart 1, table 3), placed in the refrigerator, gradually dropped 3.2° C. before infection. After infection the tem-

Digitized by Google

perature fluctuated 10.0° C. The increase in fluctuation of 6.8° C. seems attributable to the influence of trypanosomes.

R156 (chart 1, table 1), placed at room temperature, shows a range of fluctuation of 2.6° C. before infection. After infection the range amounted to 2.3° C. An increase of only 0.3° C. after infection is hardly significant.

Unfortunately the rat placed in the warm room (R160, chart 2), which was to have been inoculated with *T. equinum*, died from the effects of the heat during readings before infection, so that there is no evidence of the influence of this form upon the host in prolonged heat.

3. The Effect of Inoculation with T. evansi Upon the Body Temperature of White Rats.

The evidence points to the conclusion that *T. evansi* interferes with thermal regulation in infected rats placed in the cold. However, the infection seems to have had no particular influence on those rats placed in the warm room. In rats under normal temperature conditions there is no indication of any effect of *T. evansi* upon thermal regulation.

Evidence for the statement that *T. evansi* interferes with thermal regulation in the cold is as follows:

R154 (chart 3, table 3), placed in the refrigerator, fluctuated over a range of 15.0° C. before infection. After infection with *T. evansi* the temperature dropped precipitously 17.9° C. within nine hours, when death intervened. This rat had a hard time in regulating its temperature in the cold before infection. This difficulty was probably due to the restraint of the wire holder upon muscular movement. After infection thermal regulation seemed to collapse altogether under the additional influence of the trypanosomes. It is impossible to say whether the parasites or the environment killed the animal. The drop in temperature may have been due to the dying condition of the rat caused by the infection, the cool surroundings merely hastening the process.

R154-A (chart 3, table 3), a rat infected with *T. evansi* and placed in the cold to replace R154, fluctuated 16.4° C. in about 15 hours. It is remarkable that life is compatible with such

Digitized by Google

fluctuation in body temperature. Yet the animal did not succumb until after readings had been made and normal conditions resumed. In this case death was without doubt due to infection by trypanosomes. Although there is no record of the fluctuations of this animal before infection, it may be inferred that the excessive variation after infection was induced by *T. evansi.*

R170 (chart 5, table 3), placed in the cold, fluctuated 4.2° C. on the day before infection. After infection, on the first day it fluctuated 17.2° C.; on the second day, 19.3° C.; on the third day, 10.6° C. In every case after infection the range of fluctuation was much greater than it was before infection, the average range after infection being 15.7° C.

R169 (chart 5, table 3), placed in the cold, fluctuated 2.8° C. on the day before infection. After infection it fluctuated only 2.0° C. on the first day; on the second day, however, the range amounted to 19.3° C.; on the third day to 19.3° C. On the first day, the day of infection, the trypanosomes were probably not sufficiently virulent to produce an effect upon the thermo-regulatory apparatus.

In rats 169 and 170 the body temperature shows no tendency to the cold-blooded condition, which was doubtless due to the fact that their musculature was unrestrained, thus permitting of the proper thermal regulation. The average fluctuation range on the day before infection in these two rats was 3.5° C. After infection the average based upon the records of three successive days was 14.6° C. This seems conclusive evidence of the influence of *T. evansi* upon thermal regulation in the cold.

In support of the statement that *T. evansi* has no influence upon thermal regulation of rats at ordinary external temperatures, the following data are submitted:

R157 (chart 3, table 1), placed at room temperature, fluctuated 2.0° before infection. After infection the range amounted to 12.0° C., when death intervened. This increased fluctuation after infection cannot be attributed to the direct influence of *T. evansi* upon thermal regulation, in the light of subsequent evidence. The wide range after infection is probably due to a

Digitized by Google

fall in temperature in response to the dying condition of the rat induced by a severe infection.

R167 (chart 4, table 1), placed at room temperature, fluctuated 1.8° C. on the day before infection. After infection it fluctuated 2.0° C. on the first day; on the second day, 1.6° C.; on the third day, 4.3° C.; on the fourth day, 4.7° C., when death intervened.

R168 (chart 4, table 1), placed at room temperature, fluctuated on the day before inoculation 4.4° C. After infection the range amounted to 3.0° C. on the first day; on the second day it was 2.8° C. On this day the animal was accidentally killed.

The average range of rats 167 and 168 at room temperature before infection was 3.1° C.; during the period following infection it amounted to 3.1° C. This confirms our conclusion that at room temperature *T. evansi* has no effect upon thermal regulation.

The following evidence, furnished by rats placed in the warm room at 37.0° C. (98° F.) shows no influence of *T. evansi* on thermal regulation under this external condition:

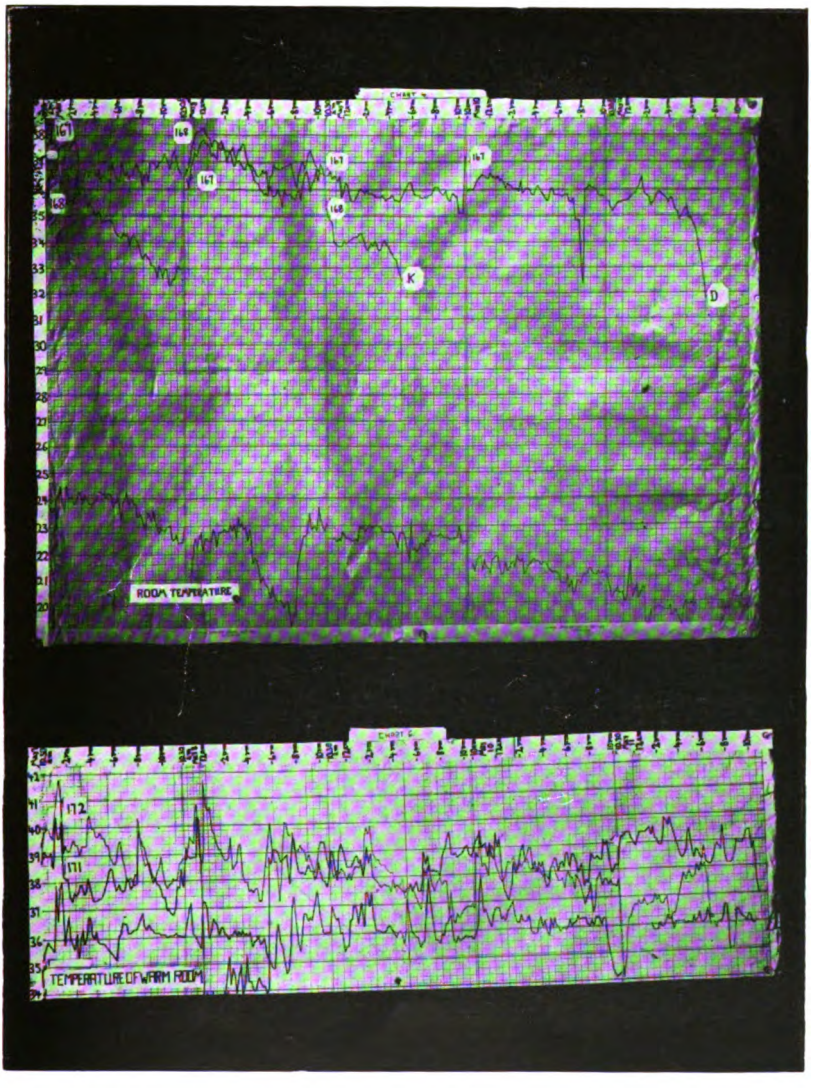
R159 (chart 1, table 2), placed in the warm room, fluctuated 1.6° C. before infection. After infection it fluctuated 3.0° C. An increase of 1.4° C. after infection seems hardly significant, especially when the records of two other rats are examined.

R171 (chart 6, table 2), placed in the warm room, fluctuated 3.5° C. on the day before infection; after infection, on the first day, May 8, readings were discarded owing to defective electrical connections which caused an apparent drop in temperature; on the second day, the fluctuation was 2.3° C.; on the third day, 2.6° C.; on the fourth day, 2.9° C.

R172 (chart 6, table 2), placed at 37° C. (98° F.), fluctuated 4.0° C. on the day before infection. After infection, on the first day the range amounted to 4.3° C.; on the second day, 3.6° C.; on the third day, 2.9° C.; on the fourth day, 4.0° C.

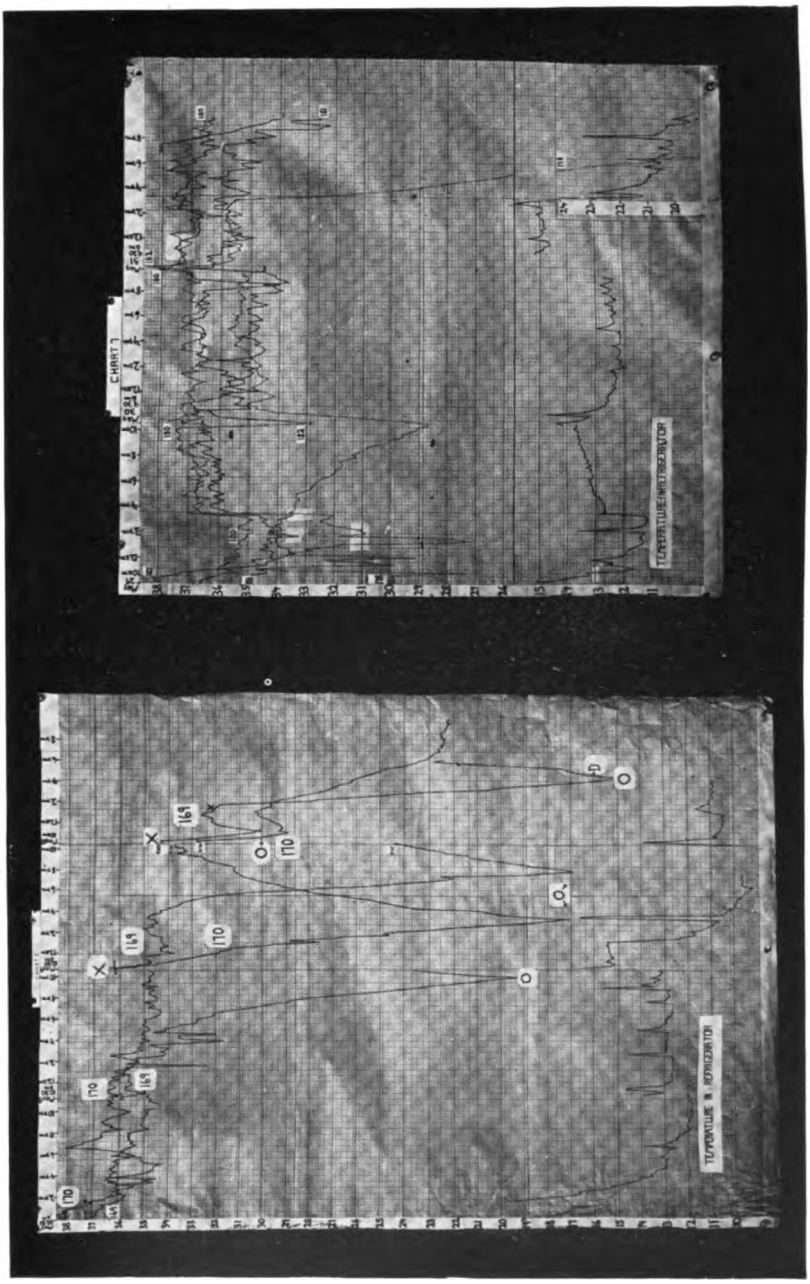
The average range of rats 171 and 172 before infection is 3.7° C. After infection the average of the readings of four successive days was 3.1° C. We have already referred to the reversion to the poikilothermic condition which these rats manifested. This may have obscured the influence of

Digitized by Google



Digitized by Google

Digitized by Google



INFLUENCE OF EXPERIMENTAL TRYPANOSOMIASIS GRAHAM AND HUTCHISON

Digitized by Google

Digitized by Google

T. evansi upon thermal regulation, but it could not be assumed on the strength of this possibility that any such influence occurred.

4. As to the Effect of Inoculation with T. brucei Upon the Body Temperature of White Rats.

Although in the majority of cases the average fluctuation range of infected rats kept in the refrigerator is much greater than that of three healthy rats (R180, 181, 182, chart 7, table 3) kept under the same external conditions, in one case of infection with *T. brucei* this greater degree of fluctuation did not accur. R178 (chart 7, table 3), infected with *T. brucei*, and placed in the cold, gave an average fluctuation range of but 3.2° C., amounting to only 0.1° C. more than the average range of uninfected rats 180, 181, 182, which was 3.2° C. Although the method of comparing results obtained from one rat with those obtained from others is not as reliable as a comparison of results from the same rat before and after infection, the evidence seems convincing in the case of R178 that the strain of *T. brucei* used had no thermal influence, especially when it is found that this rat manifested about the same degree of thermal fluctuation under the influence of prolonged cold as did rats 169 and 170 before infection and uninfected rats 180, 181, and 182. The lack of thermal influence on the part of *T. brucei* in the cold is perhaps due to the fact that the strain of this trypanosome employed was much lower in pathogenicity than that of *T. evansi;* R178 being inoculated with *T. brucei* from a guinea-pig, R169 and 170 being inoculated with a strain of *T. evansi* passed through a large number of rats.

The curves of healthy rats kept in the cold for twelve-hour periods of three successive days (R180, 181, 182) serve to prove one point conclusively, and this is, that uninfected rats free to move in a cage are able to maintain a fairly constant level of body temperature under the influence of cold. This proves that the wire holders around the rats placed in the cold in the first experiment caused a tendency to reversion to the cold-blooded condition. The curve of the temperature in the

Digitized by Google

refrigerator during the time rats 180, 181, 182 were in it will be found on chart 7. Examination of it will show that on the first two days these rats were subjected to periods of cold during which the mean average external temperature was about 13.0° C. In many cases the temperature in the refrigerator dropped much lower than the average and remained so for some time without affecting the body temperature of the rats.

5. The Influence of Prolonged Heat and Cold Upon T. evansi.

The few observations we had opportunity to make show that prolonged cold seemed to retard the development and diminish the virulence of infection; for rats 169 and 170, kept in the cold, showed few trypanosomes at the time of death. On the other hand, R167, kept at room temperature, showed the enormous number of parasites regularly seen at death in rats. Prolonged heat in one case diminished the number of trypanosomes, and in another case seemed to have no influence whatever, the usual swarm of flagellates being present at the time of death. R171, kept in the warm room, showed numerous trypanosomes in the specimen of its blood examined shortly before death. On the other hand, R172, likewise kept at 37.0° C. (98° F.) showed no trypanosomes in its blood at the time of death.

More detailed observations are necessary before any positive conclusions as to the effect of heat and cold upon the pathogenic trypanosomes *in vivo* can be drawn. The little evidence in this regard obtained in the course of these experiments points to the influence of abnormal external conditions of temperature upon the virulence of infection. As far as this evidence goes it shows that external heat and cold exert no influence whatever upon the fatal outcome of infection.

Conclusions.

1. In white rats experimental trypanosomiases cause no rise in body temperature.

2. Pathogenic trypanosomes of high pathogenicity seem to decrease the power of thermal regulation in white rats under

Digitized by Google

the influence of prolonged cold; but the non-pathogenic form, *T. lewisi*, does not show this effect.

3. In white rats at ordinary temperature and under the influence of prolonged heat, none of the trypanosomes used in these experiments had any effect upon thermal regulation.

4. From observations made upon the blood of infected rats it seems that conditions of prolonged heat and cold may possibly decrease the virulence of pathogenic trypanosomes without diminishing their pathogenicity.

References.

1. Phillips, E. F., and George S. Demuth. (1913). The behavior of bees in winter. Bulletin, U. S. Dept. of Agr.

2. Tigerstedt, R. (1910). Die production von Wärme und der Wärmchaushalt. Winterstein, Handbuch der Vergleichenden Physiologie, Jena, 1910.

3. Laveran and Mesnil. (1912). Les Trypanosomes et les Trypanasomiases.

4. Schaeffer. Text-book of Physiology.

5. Sumner, F. B. (1913). Effects of atmospheric temperature upon the body temperature of mice. *Journ. Exp. Zool.* Oct. 5, 1913, Vol. 15, No. 3.

Explanation of Charts.

The sign O on the surve signifies that the rat was removed from the refrigerator; X signifies that it was put back into the refrigerator; D signifies death of rat; K signifies accidental death. Further explanation will be found on each chart.

Digitized by Google

THE RELATIONSHIP OF ANAPHYLAXIS TO IMMUNITY.*

A Preliminary Note.

By

FRASER B. GURD, B. A., M. D.,

Montreal.

From the Laboratories of the Department of Experimental Medicine, McGill University.†

Ever since the discovery of the phenomenon of anaphylaxis numerous investigators in the field of immunology have interested themselves in an analysis of the various aspects of this phenomenon and have attempted to procure data upon which an hypothesis which might indicate the correlation of the state of hypersensitiveness and so-called immunity might be built. Obviously the development of the hypersensitive state, which occurs in normal animals following the introduction, parenterally into its tissues, of heterologous proteins, cannot be accepted as being simply an interesting laboratory phenomenon. The fact—now well established—that in order to render an animal "immune" to a complex proteid it is necessary that the animal first become potentially, at least, anaphylactic, is too striking to have been passed over by observers without attempts at explanation.

Two theories in particular have been projected and much experimental data published in order to support each of the two respectively, and at the same time to disprove the adequacy of the other point of view.

The first of these theories and one which has obtained recently a keen protagonist on this continent in the person of Richard Weil,[1] assumes that the sensitive animal is such because certain of its tissue cells have produced sessile receptors, having an affinity for the specific antigen, and that the protection from injurious action enjoyed by immune animals is due to the

*Read before the American Society of Bacteriologists, January 2nd, 1914.

†Aided by the John Baillie Fund for Immunity Research.

1. Weil. *Jour. Med. Res.*, Vol. XXVII, p. 497.

Digitized by Google

fact that the blood plasma of immune animals contains free anti-bodies so that the free receptors attached to the cells are guarded against the action of the injected protein. This hypothesis appears to assume that proteins, as such, are toxic to such cells as possess receptors capable of fixing them, and that the hypersensitive or anaphylactic state is developed as the result of the production, on the part of the cells, under stimulation, of such fixing receptors. The further development of free receptors as the result of repeated sublethal injections, according to this point of view, results in the protection of the cells through an absorption, as it were, of the toxic protein.

Those investigators (Weil,[1] Besredka[2]) who most earnestly support the conception of anaphylaxis and immunity as consisting simply in the primary production of "sessile receptors" and ultimately of free "immune bodies," lay great stress upon the fact that according to their theory immune processes are shown to be cellular and that any other point of view suggests that the process is entirely humoral. This attitude is, in the author's opinion, unreasonable, since it is obvious that whatever may be the correct explanation of these phenomena, the process must be primarily due to cellular activity and ultimately to cellular intoxication .

The second theory, in point of time, and the one which has found most general acceptance, accepts the experiments of Vaughan[3] upon the cleavage of proteins with the production of toxic split products, and those of Friedberger in the production of the so-called anaphylatoxin, as well as the work of Alberhalden,[4] Zunz[5] and others who have proven the presence of proteoclastic ferments in the blood of sensitized and immune animals. Basing our conception of anaphylaxis and immunity upon the fact that the majority of native proteins are not poisonous to normal animals and upon the fact, now well established, that the serum of sensitive and immune animals contains sub-

2. Besredka. Comptes Rend. Soc. de Biologie 1907, Vol. LXIII, p. 294.
3. Vaughan, Vaughan and Vaughan. Protein Split Products. 1913 Lea and Febiger.
4. Alberhalden. Abwehrpermente des tiersehen Organismus. 1913. I. Springer.
5. Zunz Ref. Vaughan *Loc. cit.*

Digitized by Google

stances (ferments) which are capable of inducing cleavage of the protein molecule with the liberation of a highly toxic substance, closely related to the peptones and proteoses, at least in so far as this relationship refers to the stage in the digestive process at which they are produced, this theory assumes that the hypersensitive state is due to the presence in the tissues of the animal of proteolytic ferments . These ferments are produced following cellular stimulation by means of the primary injection and are potent to cause partial cleavage of the complex proteid with the production of toxic split products.

That these ferments must be produced by the cells of the body is physiologically obvious and that they should persist in close association with the cells responsible for their production so that animals remain sensitive even after demonstrable amounts are absent in the serum, seems, a priori at least, equally reasonable. That, moreover, following the passive sensitization of normal animals the ferments injected should become localized in certain cells does not appear to be entirely unlikely. Such facts, therefore, as the difficulty of producing transferred sensitization without the lapse of a few hours following the introduction of the sensitizing serum and the diminution—as proven by Weil and others—of the amount of circulating anaphylactic body in the serum, do not in any way discount the satisfactoriness of such an hypothesis.

When an attempt is made to explain the fact that repeated sub-lethal injections of the same protein renders the animal insusceptible to poisoning by relatively large doses of the protein, several theories have been offered, in addition to that of free as opposed to sessile receptors. Friedberger suggests that remnants of the antigen (injected protein) persist in the tissues and that these render the animal refractory. This view, it may be stated, has not met with acceptance, and has been apparently disproved.

Vaughan refers to the condition as one of tolerance, but gives no clear conception of what may be the possible nature of such tolerance. He states specifically, in speaking of his toxic split product, that when repeatedly injected in non-lethal doses the animal does not elaborate an anti-body—an anti-toxin. He

Digitized by Google

does, however, state that the phenomenon requires further study, employing the method of passive immunization. The author believes that the experiments reported in this paper supply certain data suggested by Vaughan as being desirable.

As is but natural, it has been suggested that when large amounts of the ferment are present in the blood and tissues the hydrolysis of the foreign protein, when reinjected, advances rapidly to a further point resulting in the production of non-toxic end products. For the most part this explanation has been merely an assumption and has not been proven directly. Friedberger has shown that the poison as prepared by him may be destroyed by too long digestion or by an excess of anaphylactic serum.

For the last two years the author, in association with Dr. J. C. Meakins, has carried out experiments in the hope of proving by direct methods the presence in the serum of so-called immune animals, of a substance capable of protecting the sensitized animal against the manifestations of anaphylaxis. As has been the case with all observers working upon the phenomenon of transferred anaphylaxis, numerous failures, due no doubt to improper relationship of quantities, have been met with. Certain results have been extremely satisfactory, more particularly those obtained recently. I will quote but two characteristic protocols:

Experiment A. 137.

Three guinea-pigs, weighing 340 grams each, were injected with immune rabbit serum (38) of such a titre that 0.6 c. c. injuected intraperitaneally sensitized animals (250 grams) so that upon the following day 5 minims of sheep serum caused typical anaphylactic death; 0.5 c. c. of the rabbit serum did not, however, result in death, although marked symptoms developed. It should be noted in connection with this experiment that the rabbit was bled 14 days following the last injection of sheep serum.

G. P.	1st Day.	2nd Day.	3rd Day.
109	0	.66 R. S. 1. p.	5 m. i. v., marked malaise
103	4 cc. R. S. 1. p.	4.5 cc. 1. p.	7 m. i. v., slight malaise, no symptoms
110	0	.66 1. p.	6 m. i. v., immediate onset of marked symptoms. Death within 12 hours. Autopsy characteristic.

Digitized by Google

In the foregoing experiment the animals were allowed to pass through the so-called "incubation stage." As is seen the injection of larger quantities of serum were sufficient to protect the animal (103) against the anaphylactic shock which followed in the other two animals.

The following protocol showing the effect of immediate toxic injection in passively sensitized guinea-pigs, is even more striking, although none of the animals died:

111. 280 grams. Received .9 c. c. of rabbit serum (38) i. v., within two minutes 7 minims of sheep serum i. v.—marked immediate symptoms for ten minutes—rapid recovery.

113. 275 grams. Received .5 c. c. of rabbit serum (38) i. v., within two minutes 7 minims sheep serum i. v.—immediate onset of marked symptoms progressing to convulsions and paralysis, apparently dying, but recovered.

112. 280 grams. Received 2.75 c. c. i. v. rabbit serum (38) i. v. within two minutes 7 minims sheep serum i. v. —no symptoms.

These experiments prove that the blood serum of immune animals contains not only sensitizing bodies, but also some substance which is potent to protect the animal from the effects of the cleavage toxic split products. Theoretically, this substance might consist of an anti-ferment, an excess of the anaphylactic ferment which latter must in this case be assumed to be capable of more or less completely digesting the toxic split product into simpler harmless substances, or there is produced following the reinoculation of sensitive animals a second type of ferment for the purpose of destroying (by digestion) the toxic moiety.

The likelihood of anti-ferment action being responsible for the protection induced is very remote; there is little to support this view and many observations would indicate that it is not the correct one. That an excess of the same enzyme-like substances which are responsible for the sensitive state is responsible for the further cleavage and consequent detoxication of the poison seems more reasonable, but this view also fails to explain certain phenomena such as the focal reaction which occurs at the foci of bacteria following the parenteral introduction of bacterio-protein such as tuberculosis, staphylococcus vaccine, etc.

Digitized by Google

The author wishes to suggest the following hypothesis which he believes is based on adequate experimental and clinical data:

The parenteral introduction of heterologous proteins into the animal body is followed by the elaboration of specific ferments which so act upon the complex proteid molecule that cleavage occurs with the liberation of a toxic product—similar to the poisonous split product of Vaughan, or the anaphylatoxin of Friedberger. In consequence of the presence in the tissues of this proteolytic ferment, the animal is hypersensitive to the reinoculation of the specific protein as the result of whose primary inoculation the production of ferments was induced. Sub- of the production of a second order of ferments whose activity is directed more particularly towards the more complete cleavage of the toxic split product.

For purposes of explanation I have called the anaphylactic ferment the lysin of the first order. This is the cause of the anaphylactic state. The ferment capable of digesting the toxic split product I have designated the lysin of the second order. It is due to the presence in the tissues of lysins of the second order that the repeatedly inoculated animal owes its so-called immunity to the toxin.

That it is possible to induce the production of the lysin of the second order without elaboration of those of the first order is proven by Vaughan's* experiments, in which he shows that repeated injections of the poison prepared according to his method is followed by a state (tolerance) as the result of which the animal is able to "bear three or four times the minimum lethal dose," and that furthermore such an animal is not sensitive to the whole protein from which the poison is recovered; nor it is possible to sensitize an animal with the split product alone.

Certain facts have been, I believe, proven with reference to the second order of lysin:

1. With whole proteins used as injection material the lysins sequent inoculation in sublethal doses results in the stimulation of the first order are always produced first.

*Vaughan. *Op. cit.*

Digitized by Google

2. The lysins of the first order are elaborated to a much more marked extent than are those of the second order; all immune animals are therefore potentially sensitized. This is shown by allergic reactions and passive anaphylaxis as well as by direct experiments, such as those reported in this paper.

3. The persistence of the lysins of the second order in the tissues is much shorter than that of the first order. "Immune" animals, therefore, become ultimately markedly sensitive.

THE OCCURRENCE OF THE TRICHONOCARDIASES IN NEW ORLEANS.

By

FOSTER M. JOHNS, M. D.,

School of Hygiene and Tropical Medicine, College of Medicine, Tulane University of Louisiana, New Orleans.

Introductory.

In a recent article by Chalmers and O'Farrell,[1] 1913, attention has been drawn again to the prevalence in the tropical countries of Ceylon, the Anglo-Egyptian Sudan, and the Gold Coast, of a fungus disease of the axillary and pubic hairs first described by Castellani in 1911 in a paper published in the *British Journal of Dermatology,*[2] and in 1912 in the Transactions of the Royal Society of Medicine,[3] in which the disease was named *Trychomycosis axillaris*, with the subdivisions *flava, rubra,* and *nigra.*

Chalmers and O'Farrell,[1] in a very complete article, fully illustrated, also draw attention to the fact that the disease may occur on the hairs of the pubis independently of any axillary infection, and suggest the term *"Trichonocardiasis"* in place of the name introduced by Castellani.

Chalmers and Stirling,[4] in a paper several months later, report an epidemic of forty-two cases occurring in a regiment stationed in Khartoum. In this epidemic the mode of infection was fairly well demonstrated to be from infected washmen in the common washhouse.

Digitized by Google

As at present the trichonocardiases are only known to exist in the above mentioned countries, it may be of interest to note their presence in New Orleans, with its sub-tropical climate. Again, their presence here would probably mean a world-wide distribution of the diseases in tropical and sub-tropical countries.

The Case.

The patient, a medical student in Tulane University, first noticed a reddish-yellow discoloration of his underclothing covering the axillæ, coincident with the beginning of warm weather in April. Frequent bathing for several weeks seemed only to increase the amount of discoloration found each evening, and my advice was sought with regard to the possibility of a fungus disease being present.

A study of the hairs of the axillary regions revealed the typical lesions of the hair shafts as described by Chalmers and O'Farrell. From very heavy excrescences of reddish and yellow material found on one side or ensheathing the hair (Fig. IV), to the early infections presenting only clumps of yellowish material beneath the cuticle just anterior to the edge of a raised epidermal scale (Fig. II), all degrees of the conditions were found. Cleared specimens under high magnification revealed the presence of the radiating hyphæ of *Mocordia tonnis*, the causative fungus of the disease. Cleared specimens of the hair follicle appeared normal (Fig. V). The skin covering the axilla was congested and very irritable.

Infection in this instance probably took place from contact with an infected patient in the Charity Hospital of this city, where the student had been making bedside examinations during the previous month.

A search for more cases has not yet been made, but the author remembers having seen at least two cases during the past year. Drs. Isadore Dyer and H. E. Menage, prominent dermatologists of this city, state that they have encountered many cases that coincide with the gross clinical appearances of this disease, many of which were probably identical.

Digitized by Google

Cultural Experiments.

The Trichonocardiases are all due to a fungus, *Mocardia tennis* (Castellani, 1911), either alone as in Trichonocardiasis flava, or in association with *Micrococcus nigrescens* (Castellani, 1911), as in Trichonocardiasis nigra, and *Micrococcus castellani* (Chalmers and O'Farrell, 1913), as in Trichonocardiasis rubra.

With regard to the cultivation of these organisms, *Mocardia tennis* has not been cultivated permanently or in pure culture; the associated micrococci have both been isolated and continued in culture. Chalmers and O'Farrell succeeded in inducing growth by placing scrapings from the hairs in equal parts of human blood serum and 0.85% normal saline in hanging drop preparations. These were first kept for twenty-four hours at the room temperature, which varied from 32° C. at night to about 40.6° C. in the day, and were then placed in an incubator at 40° C. Under these conditions the fungus quickly grew out of its amorphous bed, which encircled the hairs, into the surrounding liquid, the fungus showing non-septate hyphæ without differentiated nuclei, and after showing monopodial branching. The hyphæ were composed of thin bacillary-like forms ranging from about 2 to over 7 microns in length, and from 0.14 to 0.5 of a micron in breadth. In stained preparations the cytoplasm appears to be homogeneous except at certain places where well-defined, deeply stained, rounded granules may be seen to be placed at one end of the hypha or at regular intervals through the cytoplasm.

In my set of cultural experiments early infected hairs were employed for inoculation of the cultures, for here the fungi are well protected by the epithelial scales covering the hair as well as the cuticular layer. The hairs were first rinsed lightly for several seconds in 50% methyl alcohol, and then washed thoroughly in sterile water, thus removing the greater part of the contamination. The hairs were then flattened out on the surface of previously prepared media in petri dishes.

Several different media gave good results. The easiest to prepare and the one giving probably the quickest growth was made by adding 0.5 c. c. defibrinated blood plus 0.5 c. c. ascitic fluid to 5 c. c. of a neutral 2% agar that was first melted up

Digitized by Google

and then cooled to 60° C., when the blood and ascitic fluid were added. This mixture was kept at 60° C. for fifteen minutes, and then poured into the petri dish. The cultures were incubated at 37° C.

On examining the plates under low dry magnification two days later the cuticle of the hairs over each infected area appeared elevated and roughened, with long ray-like filaments radiating out from an occasional split in the cuticle (Fig. VI). Some of these radiating growths were deep yellow, others show only a light greenish tinge, using the ordinary daylight illumination. An occasional colony of an infecting coccus or bacillus growing along the hair shaft was noted. On the third day the radiating growth was very marked, the cuticular fibres were split and broken, and many long streams of radiating growth thrown out (Fig. VII). In the majority of cases a heavy yellowish growth of cocci was spread beyond the zone of radiation, the media being decolorized, and a light yellow pigmentation permeating the decolorized zone.

Similar plates of media were streaked from the growths in these nodes of infection. On the second day many colonies, pinhead in size and bright yellow in color, were visible, and a lesser number of smaller white colonies could be made out with a hand lens. On the third day the colonies were examined; the yellow colonies consisting of a coccus, while the smaller white colonies appeared as a beaded bacillus. The latter colonies were restreaked on ordinary agar and the special blood-ascitic fluid agar. On the fourth day no apparent growth on the agar and pinhead colonies on the blood-ascitic fluid agar. The appearance of this organism is shown stained with Lœffler's methylene blue stain in Fig. VIII. The yellow growth of cocci is probably *Micrococcus castellani* from the description given by Chalmers and O'Farrell. It is also very probable that the beaded organism cultivated as described above is *Mocardia tennis,* from its similarity to the cultural forms described by the same authors. No branching forms were found, but the cultural characteristics of moulds in general change so completely with different culture media that their absence would hardly bar the possibility.

Digitized by Google

Further cultural studies are now in progress and the identity of this organism definitely established.

Conclusion.

Trichonocardiasis flava and rubra have been found in at least one instance existing in New Orleans, and probably as an endemic infection.

The trichonocardiases probably have a worldwide distribution in tropical and sub-tropical countries.

An organism has been cultivated in pure culture from infected hairs which bears some resemblance to the described cultural forms of *Mocardia tennis.*

Bibliography.

1. Chalmers and O'Farrell. Annals of Trop. Med. and Parasit. Vol. VII, No. 4, December, 1913.

2. Castellani. *Brit. Jour. of Derm.*, XXIII, p. 341, 1911.

3. Castellani. Transactions of the Royal Society of Medicine, VI, No. 2, p. 23, December, 1912.

4. Chalmers and Stirling. Annals of Trop. Med. and Parasit.. Vol. VII, No. 4, December, 1913.

Explanation of Plate.

Fig. I.. Photomicrograph of a normal axillary hair.

Fig. II. The early lesion beneath the cuticular scales.

Fig. III. A moderate ensheathing mass of growth cleared to show the elevated cutice.

Fig. IV. A typical nodose mass.

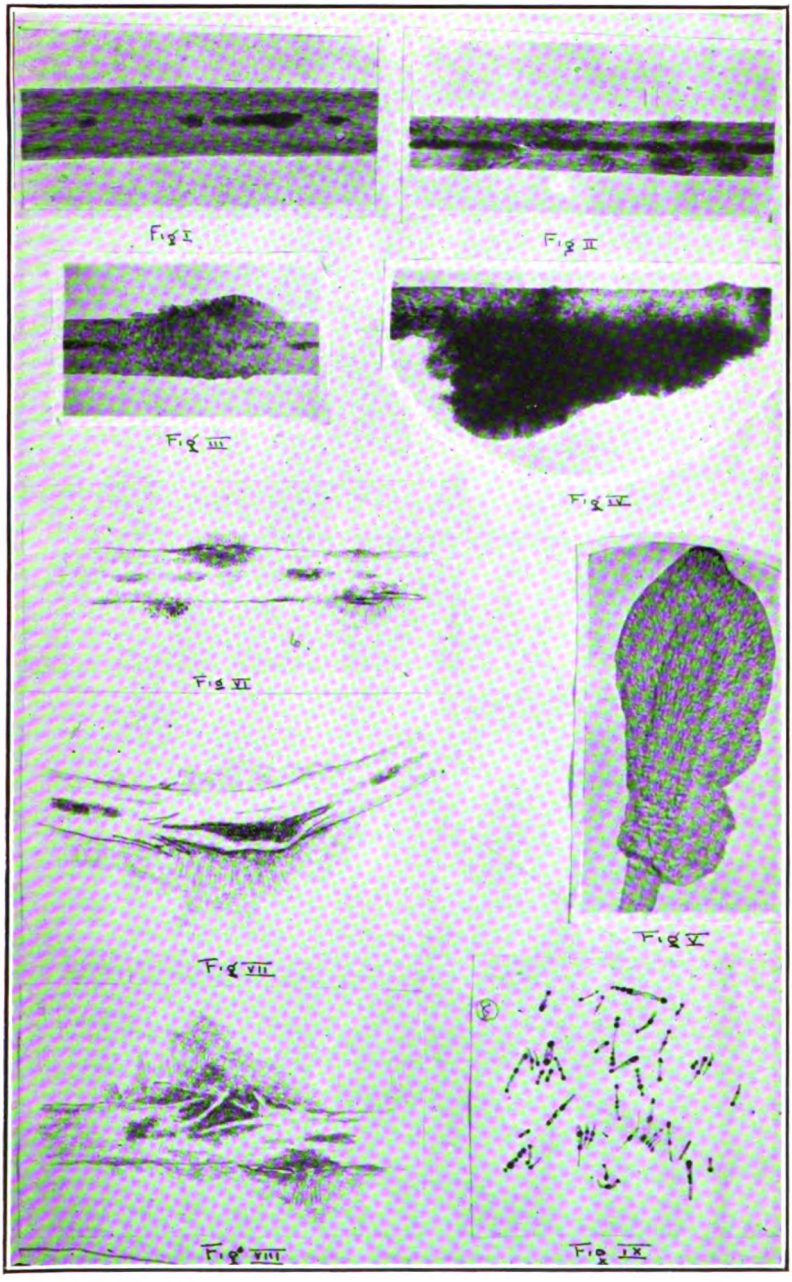
Fig. V. Hair root from heavily infected hair cleared to show normal appearance.

Fig. VI. Drawing showing the fungi growing out onto a specially prepared agar medium from the early sub-cuticular lesions. 48 hours incubation, 37° C.

Figs. VII and VIII. Radiating growths from sub-cuticular lesions. 72 hours incubation, 37° C. Also showing the split and broken appearance of the cuticular fibres caused by the outward growing fungi.

Fig. IX. Beaded organism cultivated from out-growths on infected hairs on culture media. Zeiss, Compens. Ok. 6, Oil Imm. obj. 2 m. m. Reichert camera lucida, angle 45°, drawn at level of table.

Digitized by Google



Digitized by Google

Digitized by Google

EPIDEMIC CLIMATIC BUBO.

By
N. BARLOW, M. D.,
Cuyamel, Honduras.

Since March 15 there has been prevalent in certain localities near Cuyamel an epidemic form of climatic bubo, which differs in some particulars from that described by Castellani and Chalmers.

Etiology.—It is apparently carried by some biting insect; in some cases a history or other evidence of bite can be obtained. Puncture of a gland yields only sterile gland juice; no causal organism could be found in over twenty punctures. Two cases were seen in children and one in a middle-aged woman.

Symptoms.—Incubation unknown. The disease sets in rather sharply, with pains in the limbs and back, headache, anorexia, rarely nausea and vomiting, irregular fever rarely higher than 102, and painful swelling in and around a single gland, with redness of the superjacent skin. In no instance was more than one gland involved. The fever lasts from five to eight days in untreated or improperly treated cases, followed by a gradual convalescence of a week or more. Except in cases of secondary infection the glands never suppurate. Most cases of suppuration were due to staphylococci, a few to streptococci, and one ease to *B. tuberculosis*, probably from the disease occurring in an already tuberculous gland. Any gland of the body may be affected, but usually one of the inguinal or axillary glands. In one case it was evidently a pelvic gland which was involved.

Diagnosis.—From venereal and symptomatic bubo by the absence of source of infection and by the examination of the gland juice. From plague, by the examination of the gland juice, and by the mild character of the symptoms. A puncture of the gland should never be omitted. The diagnosis of the affection in a pelvic gland would be impossible excepting during an epidemic.

Treatment.—Salicylates, pushed to large amounts, 40 grains or more daily, are specific. If begun early, on the first or second

Digitized by Google

day, the patient may be at work in three days. Special warning should be given against wet dressings of any kind and against tincture of iodine or any other counter-irritant. The former are almost invariably followed by secondary infection and suppuration and the latter are likely to aggravate the pain and fever and to prolong the course of the disease. If some external application is demanded, ichthyol ointment, a weak solution of tinct. bezoin co., or glycerin boracic acid paste, will be harmless. Rest in bed and attention to the bowels are of course indicated. All drugs other than the salicylates were found useless.

Prognosis.—The subacute and chronic forms described by Castellani and Chalmers do not seem to occur in the epidemic variety. If secondary infection does not occur, the patient will return to work in about two weeks; if proper treatment is instituted by the second day he may return much earlier. The gland will remain enlarged. Suppuration prolongs convalescence but is not usually much to be dreaded.

Digitized by Google

IMPETIGO TROPICA.

By
N. BARLOW, M. D.,
Cuyamel, Honduras.

In Honduras and other places on the Caribbean Sea a dermatosis is seen, allied to the impetigo contagiosa of the temperate climates. On account of its more rebellious course, it is likely to prove a source of embarrassment to the practitioner on his first encounter with it, especially if he considers it as impetigo contagiosa, and gives the corresponding prognosis.

Etiology. Morbid Anatomy.—There is invariably a staphylococcus which shows a tendency to be in pairs like a diplococcus, and to be found enclosed in pus cells. The secretion from fresh lesions appears to be serum, but a stained specimen always shows numerous pus cells, about equal numbers of mono and polynuclears, and about 10% basophile cells. Only a few cells contain cocci, but these usually contain many. A few aggregations of cocci may be found outside of the cells. In some cases careful search must be made before the characteristic organism is found. In these the diagnosis may be made from the basophile cells, if the clinical diagnosis is uncertain, as in the adult form. The morbid process is an inflammation of the upper layers of the rete, and exhibits a peculiar dissecting character. If the covering of a recent lesion in a child be removed, no definite base is seen, but a succession of layers, separated by sero pus. The dissecting nature of lesions in adults is described below.

Blood Changes.—The leucocytes are not increased above ten or twelve thousand. The only alteration in the blood is an increase of the differential polymorphonuclear count and a moderate eosinophilia. These are not constant. The susceptibility is greater the younger the subject. Nurslings are not often subject to contagion, but if brought in contact with infected children they suffer severely. In adults the susceptibility is so slight that the disease remains local.

Symptoms.—There may be a prodromal period of one to three days, in which the child is restless, irritable, and has slight

Digitized by Google

disturbance of the digestive organs, or even vomiting of a mild character. The eruption appears in successive crops. The sites of predilection are in order, legs, forearms, hands, feet, fingers, thighs, arms, scalp, other parts of the body, and, in contrast to I. contagiosa, last of all, the face. The mucous membrances and the eye are not affected. In one instance only was the vermilion border affected, and then only by a very small lesion. The eruption has no preference for either flexor or extensor surfaces, nor for folds or creases, and shows no tendency to form groups or clusters. Each crop may number from 10 to 50 lesions. Occasionally new lesions are formed near old ones by autoinoculation from scratching, but this is the exception, as a pruritis which is annoying during the formative stages usually ceases before rupture of the vesicle.

The lesions begin as superficial papules, ⅛ to ¼ inch in diameter, pinkish or red after scratching, otherwise of the color of the skin. In two or three days the papule becomes a vesicle of a yellowish or brownish color, which soon breaks or dries down, leaving a thin yellowish crust, which, if removed, leaves a shining red surface with few bleeding points. The lesion extends at the edges, dissecting the horny layer from the rete, and leaving a crusted center. The process does not extend in depth. These crusted patches may reach two or more inches in diameter. With each new crop of papules there is in some cases a slight fever, with loss of appetite, and after some months the child may lose weight. In others no constitutional symptoms occur.

In adults the disease seldom occurs and then usually only a single patch on a hand or foot, or the adjacent sides of two fingers. The dissecting character is particularly manifest in adults. A wheel of vesicles or a ringlike vesicle may be seen, and the skin may be healed in the center.

Prognosis.—If left untreated, the disease may persist indefinitely. The writer has seen cases of eight and ten months standing. The general health is rarely affected. If treated daily, the disease will persist from one to three months. If treated with the most diligent and persistent attention, the case may be cured in two or three weeks, but even in the better class of families, the attention cannot usually be obtained.

Digitized by Google

Treatment.—The following remedies have been tested by checking them against each other on children in whom the two legs were equally affected.

Solutions—Mercury bichloride, aluminum acetate, lead and opium, carbolic acid, creolin, salicylic acid in alcohol, tinct. iodin, pure and diluted.

Ointments—Chrysarobin, resorcin, balsam Peru, carbolic acid, ichthyol, zinc oxide, oleate of mercury, sulphur, ammoniated mercury, various compound ointments.

Internally—Arsenic.

The most efficient remedies are, in their order:

1. Careful removal of crusts and horny layer above all vesicles and the margins of all patches, following by painting with tincture of iodine.

2. Keeping all affected parts bandaged with a paste of powdered boric acid and glycerin, containing 2 to 4% ammoniated mercury; with daily gentle scrubbing and removal of the tops of vesicles.

3. Gentle scrubbing with solution of mercury bichloride, 1-1000, followed by ointment of ammoniated mercury, 3%.

4. 25% sulphur ointment.

The first method is scarcely applicable to children, but is the quickest cure for the single lesions of adults. A patch is often completely healed in four days.

Diagnosis.—In children in the first two days from varicella by the absence of hyperemia, by the smaller number of lesions and by the distribution. Later from impetigo contagiosa by the thin crusts, the dissecting character of the patches, and the character of the secretion as described above. In adults from a scaly eczema, which it much resembles in some cases, by the vesicular dissecting margin, and by the examination of the secretion. The annular patches with healed centers are likely to be called ringworm by the patient, especially if they have been present for some time, but the dissecting vesicular margin is sufficient to prevent such an error.

Digitized by Google

AMERICAN SOCIETY OF TROPICAL MEDICINE.

Eleventh Annual Meeting

ADMINISTRATION BUILDING, HARVARD MEDICAL SCHOOL

Boston, Mass.

May 29, 30, 1914

Headquarters of the Society, Copley-Plaza Hotel.

Friday, May 29, 1914, 10.00 A. M.

1. President's Address—Richard P. Strong, Boston.
2. Secretary's Report—John M. Swan, Rochester.
3. Treasurer's Report—Joseph D. Weis, New Orleans.
4. The Blood in the Tropics — Weston P. Chamberlain, Plattsburgh Barracks.
5. Observations upon the Morphology, Life Cycle and Relation to Disease of Entameba Histolytica—Charles F. Craig, Fort Leavenworth.
6. Experimental Amebic Dysentery in Lower Animals—Andrew W. Sellards and Walter A. Baetjer, Baltimore.
7. Observations of Free Living and Pathogenic Amebæ, with Especial Reference to their Biology and Clinical Significance—Maurice Couret, New Orleans.

Friday, May 29, 1914, 2:30 P. M.

8. Filterable Spirochetæ—S. Burt Wolbach, Boston.
9. Spirochetes and Fusiform Bacilli in Various Tropical Lesions—Weston P. Chamberlain, Plattsburgh Barracks.
10. The Methods of Transmission of Several Insect-borne Diseases of South America—Charles T. Brues, Boston.
11. The Behavior of the Hansen Bacillis in Vitro—Charles W. Duval, New Orleans.
12. The Isolation of Diphtheroid Organisms from Lymphadenomatous Tissues of Man—John A. Lanford, New Orleans.

Digitized by Google

Saturday, May 30, 1914, 10:00 A. M.

13. A Description of Philippine Specimens of Paragonimus from Man—Phillip E. Garrison, Boston.

14. Sparaganum Mansoni: First Reported American Case. Found in a Breast Tumor at Operation—John T. Moore, Houston.

15. The Relationship between the Nephritis of Asiatic Cholera and Nephritis as it exists in Temperate Zones, with Special Reference to Acidosis—Andrew W. Sellards, Baltimore.

16. The Late Outbreak of Plague in Havana, Cuba—Aristides Agramonte, Havana.

17. Recent Discoveries in Relation to Infectious Diseases in South America—Richard P. Strong, Boston.

Saturday, May 30, 1914, 2:30 P. M.

18. Election of Officers and Members.

19. The Effect of Ultraviolet Light on Protoplasm—S. P. Beebe, Boston.

20. The Occurrence of Malaria in New England—Fritz C. Hyde, Boston.

21. Splenic Anemia—Joseph D. Weis, New Orleans.

The following papers will be read by title:

The Way in which Yellow Fever is Attacked in Mexico and Its Results—Edouardo Liceaga, Mexico City.

Malaria—C. C. Bass, New Orleans.

It is hoped to have addresses by Professor Theobald Smith and Professor William M. Wheeler.

Digitized by Google

NEWS AND COMMENT

The International Child Welfare Convention is to be held in Washington, D. C., May 22-27.

A large reception will be given on May 28 at the opening of the Institut für Schiffs-und Tropenkrankheiten in Hamburg, Germany.

Dr. Walter McCaw, formerly of the Library, Surgeon General's Office, Washington, D. C., is now with the Medical Corps, U. S. A., Manila, P. I.

The Board of Health of Hanover County, North Carolina, will distribute during 1914 free anti-typhoid vaccine to all applying for it.

Dr. S. T. Darling, Ancon Hospital, and Major Robert E. Noble, Medical Corps, U. S. A., who accompanied General Gorgas to South Africa, have returned to the Canal Zone.

The Pennsylvania Railroad System has instigated more stringent rules for the examination of employees for communicable diseases and for the inspection of dining, buffet and kitchen cars.

Senior Surgeon Joseph H. White, U. S. P. H. S., New Orleans, has been granted a year's leave of absence, in order to take up the work of the Rockefeller Commission for the Eradication of Hookworm Disease in Central and South America.

Four new cases of bubonic plague have appeared in Havana. Suspects are being held at the Trisconia Quarantine Station for ten days for observation.

Digitized by Google

A Chair of Tropical Medicine has been established at Long Island College. Captain Arthur N. Tasker, Medical Corps, U. S. A., will be the incumbent.

Yellow fever has again appeared in Ecuador. Sixteen cases are reported from Esmeraldas and the disease is reported to be spreading over the country.

Five thousand dollars have been appropriated in Seattle to pay the salaries of thirty rat catchers. This is the outcome of a report that plague-infected rats have been found on the water front.

The friends of Dr. Carlos J. Finlay, who first announced the transmission of disease by mosquitoes, are raising a fund for the erection of a monument in his honor. Dr. Finlay has now retired from active work.

Mr. Wickliffe Rose, director of the commission appointed to institute a campaign against ankylostomiasis and other tropical diseases, and Dr. Sandwith, of the London School of Tropical Medicine, have gone to Egypt, Ceylon, the Federated Malay States and the Philippine Islands, to carry out work similar to that being done by the American commission.

The Board of Health and the milkmen of Philadelphia held a meeting there on April 2 to discuss the new rules on the sale of milk. The small dealers are objecting to that part providing for pasteurization. The new rules, which will become laws July 1, provide for the examination by the Board of Health of all persons handling milk.

The American Posture League was incorporated in Albany, N. Y., April 2. The aim of the organization is the improvement of health and efficiency by teaching the public correcting sitting and standing positions. It also hopes to improve the seating accommodations of schools, public audience rooms, factories, shops, etc.

Digitized by Google

Over 13,000,000 pounds of food were condemned and destroyed in New York City by the Department of Health during 1913. Two thousand seven hundred establishments where food is prepared were kept under supervision, and 3,200 arrests were made for violation of the pure food laws.

On March 16 a milk producer of Chicago was summoned before the Department of Health for dirty milk, but did not appear. Eleven days later a letter was received from him stating that the reason for his nonappearance was that he had been sick with smallpox since March 9. Milk had been coming from his farm during all this time.

Baltimore has been having a clean city crusade. Sanitary policemen, known as the "Sanitary Squad," have been delegated to help in the work. Each patrolman is responsible for the cleanliness of his beat, for private premises as well as alleys and streets. The patrolmen will be especially instructed and each district will be under the supervision of a sanitary officer.

A committee was recently appointed in France by the Chamber of Deputies to investigate the sanitary conditions in the army. They report that next to Great Britain the French soldiers are the best nourished in Europe. Insufficient clothing, especially shoes, has been one cause of disease, as has also lack of care on the part of superior officers in looking after the health of their men. Another cause of the high morbidity and mortality is the crowding of the barracks, many of which should be put in a more sanitary condition.

One of the newest and most advanced steps in hygiene is the teaching of mental hygiene by the Public Health Service. Believing that the mental state of persons has much to do with their physical state, a bulletin has been issued cautioning against dangerous habits of thought, such as suspicion, worry, sensitiveness, fear, fretfulness, and like thoughts. It is little realized by many how the avoidance of these will help the general health and build up both mind and body resistance.

Digitized by Google

All those applying for licenses in New York City to peddle push carts will hereafter be examined at the Tuberculosis Clinic. Preference will be given those who will be benefited by the open-air employment.

An advisory health council consisting of representatives from state and city departments, labor unions, business men's organizations, philanthropic societies, medical societies and women's organizations, has been organized by Health Commissioner S. S. Goldwater of New York City.

The nurses of the Social Service and Health Department of New York City will hereafter visit all patients discharged from infectious disease hospitals of the department. They will ascertain the surroundings of the patient and instruct the family in the care of the convalescent. A second visit will be paid to see if any secondary cases have developed.

Dr. Robert E. Swigart, Medical Director of the United Fruit Company, returning from a visit to the Atlantic coast districts of Colombia, Panama, Costa Rica, Spanish Honduras and Guatemala, reports the health conditions in these places in better shape than they have ever been. This he ascribes to the activities of the United States Public Health Service and the United Fruit Company.

The London School of Tropical Medicine has decided to give two courses a year in tropical sanitation and hygiene. The courses will begin on the first of May and the first of October and will last six weeks. The work, which is expected to be as practical as possible, will include hygiene and sanitation in the tropics, care of sick on board ship in the tropics, port hygiene, sanitary engineering and surveying, helminthology, protozoology, bacteriology and medical entomology.

At the beginning of a crusade for better meat, Charles J. Gardner, a prominent packer of Indianapolis, was tried on April 2, charged with having meat in his cooling room unfit

Digitized by Google

for consumption. Evidence also showed that tubercular and cholera hogs were butchered at the packing house. As an unfavorable verdict was rendered, the defendant will appeal the case, the outcome of which is looked forward to with interest.

All drinking water provided for passengers on electric and steam trains is to be tested by the Indiana state health authorities. The quality of the ice used, the method of handling ice and water, and the number of times filters are cleaned, will also be investigated.

Betterment of negro health was the subject of a conference of Southern Health and Educational Officers, held in New Orleans, April 24. The meeting was called by Dr. Oscar Dowling of the Louisiana State Board of Health. Five States and the District of Columbia sent delegates. Eight of the leading negroes of the South were present. To agree in practical measures for ultimate and immediate betterment was the purpose of the conference. Speakers and visitors were unanimous that the call was timely and that the need for concerted action is imperative. After lengthy discussion of many important topics, resolutions embodying the sense of the convention as to pertinent and practicable measures were adopted as follows:

That the responsibility of instituting and executing measures to improve sanitary conditions among the negroes is largely that of the white man; that the active coöperation of the more intelligent negroes should be asked and their services utilized as far as possible in executing the plans adopted; that one point of attack should be on prevailing insanitary housing conditions, the disposal of night soil and other wastes, provision of a wholesome and adequate water supply, ventilation, and light that each state and municipality obtain exact information as to the prevalence of tuberculosis, venereal and other diseases among negroes; that practical preventive measures applicable to local conditions be instituted; that the data gathered be transmitted to the local and state health officers; that instruction, definite and persistent, in the primary principles of health be given, especially by a program on health topics in every negro school in the state and ser-

Digitized by Google

mons and talks on sanitation in every negro church at frequent intervals; that teachers be asked to emphasize the element of self-control; that visiting district nurses be employed; that each state and city board of health be requested to take acion to carry these recommendaions into effect; that the American Medical Association, the American Public Health Association, the Southern Medical Association, the Southern Sociological Congress, the Southern Commercial Congress, the National Educational Association of America, The National Housing Association, the Federation of Women's Clubs, and other health and educational organizations, be requested to establish standing committees on the health of the negro.

The resolution committee consisted of Wm. C. Woodward, Washington, D. C.; James A. Hayne, S. C.; C. W. Garrison, Ark.; T. F. Abercrombie, Georgia; John C. Bell, Memphis; Herman Oechsner, Thos. A. Roy, La.; S. R. Mallory Kennedy, Florida; Oscar Dowling, La.—*Jour. A. M. A.*, May 2, 1914.

A campaign has been carried on in Chicago by the Infant Welfare Society to obtain funds sufficient to open fifty infant stations. At a public meeting addresses were delivered on "The Interest of Women in Child Welfare," by Mrs. George Bass; "The Result of Infant Hygiene in New York City," by Dr. S. Josephine Baker; "National Interest in Infant Welfare," by Miss Julia C. Lathrop; and "The Community's Responsibility in Infant Welfare," by Judge Julian W. Mack. Appeals were made to the public by signs in street cars and on billboards throughout the city and by a large illuminated sign which gave the amount added to the fund each day.

The sixtieth birthday of two of Germany's most noted scientists, Ehrlich and Behring, were celebrated in March. The discovery of diphtheria anti-toxin by Behring has shorn that dreaded and highly fatal disease of most of its terrors. This alone, exclusive of his other research work and discoveries, is enough to place the name of Behring among the first rank of those who have benefited humanity. Though the achievements

Digitized by Google

of Ehrlich are slightly less great than those of Behring, his assistance in making practical the use of anti-toxin, his recommendation of methylene blue in malaria and his discovery of salvarsan have given him a high and well-deserved place in the progress of medical science.

The corner stone of the new Calcutta School of Torpical Medicine was laid on February 24. The location of this new School of Tropical Medicine has been aptly chosen, as over a third of the deaths in Calcutta are from tropical diseases. The plans provide for a large and fully equipped building to accommodate several full-time research workers, besides the regular teaching staff. The government has provided $195,000 for the site and laboratories and will contribute to its support. The school, which is expected to be finished within a year, will be open to students from all parts of the world.

Dr. Joseph Goldberger, of the U. S. Public Health Service, has been placed in charge of the investigation of pellagra by the Service. Investigation will be conducted at several places in the pellagra section of the country. The hospital at Savannah, Georgia, will be continued under Dr. Francis. Experiments in metabolism in pellagra will be conducted at Spartansburg, South Carolina. Epidemiological studies are, we understand ,to be conducted at Milledgeville, Georgia. Dr. Goldberger was in New Orleans early in May and inquired into the availability of one of the insane hospitals of Louisiana for pellagra investigations.

Public Health Activity.

CONNECTICUT.—*Monthly Bulletin.* Open-air schools were at first thought of only in connection with tuberculosis or anemic children, but lately people have begun to realize that they are equally beneficial for all. This is evidenced in Middletown, Connecticut, where all public schools have become open-window schools. The rooms were heated during the winter as usual, but the temperature was kept down by the cool, fresh air from outside. Since November, 1913, when the plan was adopted, there

Digitized by Google

have been fewer colds and headaches among both teachers and pupils and the efficiency of the scholars is noticeably higher than before.

IDAHO.—*Health and Hygiene,* State Board of Health, March 8, 1914. "How to Avoid Consumption" is the title given this publication. It is divided into five parts. The first one gives two facts that are in themselves enough to cause one to read the remainder. They are: "Every three minutes someone in the United States dies from consumption," and "One person of every seven dies of consumption." The next paragraph tells something of the disease, the germs and early symptoms. The next division is entitled "Fundamental Principles." It gives eight facts about such things as air, sleeping rooms, long-standing coughs, etc. The last two divisions are "Things Good for Weak Lungs" and "Things Bad for Weak Lungs." When the first two facts stated are taken into consideration, it is to be hoped that the pamphlet has been widely distributed and will be read by those by whom it is most needed.

NEW YORK.—(Public Health Activity, *Weekly Bulletin* of the Department of Health of New York City.) Investigations have been made recently by the Bureau of Infectious Diseases to ascertain which was the greater, the number of secondary cases of contagious diseases resulting from those treated at home or resulting from those transferred to hospitals. It was found that the average of those treated in hospitals was much lower than those treated at home.

NEW YORK.—(*Weekly Bulletin* of the Department of Health of New York City, March 28, 1914.) A system of examination has been instituted in New York for all employees of the Department of Health. History cards will be kept and regular thorough examinations will be made. As pulmonary tuberculosis and cardiac valvular disease are among the commonest diseases found, specialists will have charge of the examination for these diseases. Though anti-typhoid vaccination is not compulsory, it will be offered all who care for it. It is believed that

Digitized by Google

this new system will mean a much higher efficiency among the employees, as well as a happier and healthier existence.

OHIO.—The monthly *Bulletin* of the Ohio State Board of Health is one of the most interesting and complete health bulletins published in the United States. The original articles this month include such as "The Health Hazards of Industries with Special Reference to Ohio," "Trachoma in Steel Mill Workers," "Some Weird Diagnoses as Observed by a Registrar of Vital Statistics" and "Difficulties of Enforcing Health Regulations." Besides these and other original articles, there are nine editorials and a department of current comments that contains a large number of short articles, or paragraphs, on subjects of interest to health workers. The bulletin is most complete and instructive.

TEXAS.—The Bexar County (Texas) Medical Society at a recent meeting passed resolutions requesting the Board of Health of the City of San Antonio to recommend that the City Council promptly pass an ordinance protecting bats. It is interesting to note that San Antonio is the home of Dr. Charles A. R. Campbell, who has been making extensive study of bats as mosquito destroyers and incidentally as protection against malaria. Evidently those best situated to observe Dr. Campbell's work are convinced that there is "something to it."

Digitized by Google

CURRENT LITERATURE

PYOSIS TROPICA IN THE ANGLO-EGYPTIAN SUDAN.—(*Journal of Tropical Medicine and Hygiene,* Vol. 16, No. 24, December 15, 1913.) Chalmers and O'Farrel give a very good account of this interesting affection resulting from the observation of two cases in Khartoum. It is a non-follicular pyosis which is characterized by the presence of thick, yellow, crusty lesions, which are proven to be shallow ulcers, irregular in outline, and edges being not undermined on removal of the crust; occasionally small, smooth nodules are present also. A staphylococcus has been isolated from the lesions, which is considered a new variety. The best treatment found by the authors was an autogenous vaccine.

P. L. Querens.

AN INVESTIGATION ON THE OCCURRENCE OF THE CHOLERA VIBRIO IN THE BILIARY PASSAGES.—(*Indian Journal of Medical Research,* Vol. I, No. 1, July, 1913.) Greig, during the recent cholera outbreak at Puri, as the result of 271 autopsies, obtained the vibrio from the gall-bladders of 81, or practically 30%, demonstrating that this secondary infection results in a larger number than was originally thought and authenticated by a sufficient number to reach a definite conclusion of the percentage of these cases. It demands consideration also in view of the fact that "carriers" are more prone to result from the recoveries, similar to typhoid and important from the possible development of cholelithiasis. Beyond the mere presence of the organism in the gall-bladder. some cases revealed the organisms lying in the submucosa with positive evidence of a true infection. Three plates occompany the article. P. L. Q.

PRELIMINARY NOTE ON THE OCCURRENCE OF THE COMMA BACILLUS IN THE URINE OF CASES OF CHOLERA.—(*Indian Journal of Medical Research,* Vol. I, No. 1, July, 1913.) Greig has recovered the cholera vibrio from the urine of eight of fifty-five cases, which organisms were thoroughly identified morphologically, culturally, and by agglutination tests. This serves to prove definitely that cholera is a true septicemia, similar to typhoid and just as liable to the same complications resulting from the organisms being disseminated throughout the body of the patient. The results also open a new problem for the prophylaxis of the infection, showing us that the urine should be dealt with as diligently as the feces.

P. L. Q.

THE DETECTION OF TRYPANOSOMES IN ANIMALS.—(*Jour. of Tropical Medicine and Hygiene,* Vol. 17, No. 2, January 15, 1914.) Lundie gives the following method for detection of these flagellates in the blood of

Digitized by Google

animals provided a large amount can be obtained: 5 c. c. of sterile water with 5 grains of potassium citrate dissolved in it are put into a sterile test tube; the throat is then cut and the bolod allowed to flow directly into the tube until three-fourths full. Agitate tube to insure mixture of the contents, then set aside for a half hour to settle. The organisms, if present, will be found in the clear upper layer, when films are made and stained. According to the author, the development can be studied by this method, also the life history in the alimentary canal of the tsetse fly by the addition of hydrochloric acid 0.2% by weight of the acid, to imitate as nearly as possible the acid content of the fly's stomach.

P. L. Q.

SANITARY CONDITIONS AMONG THE ESKIMOS.—(U. S. Public Health Reports, December 12, 1913.) Emil Krulish, as the result of a brief observation of the North American Eskimos, including a short visit to the west coast of Siberia, reports the prevalence of tuberculosis being the most frequent cause of the mortality, followed closely by syphilis, which is more confined to the Siberian coasts. Along the southern coast of Alaska trachoma is very common. The author ascribes the rapid spread of these infections to the manner of living, which is mostly in igloos, where numerous families are crowded together. While the common drinking cup, towels, and family foodpan undoubtedly serve as an important factor, they are only secondary to the crowded habitations. The water supply is furnished by collecting the melted snow, or collecting from streams when convenient. The occupations are confined to hunting, fishing, trapping, and boat building principally, although a number are engaged in raising reindeer, and these natives, being continually outdoors, are the healthiest of them all. The disposal of refuse takes place in the spring only, it being allowed to accumulate during the whole winter. The dead are now well wrapped and buried instead of being placed on elevations or in rock crevices, as formerly. Outhouses were only observed on one occasion, and these were of a very primitive type. Nine plates illustrating the most important topics accompany the article. P. L. Q.

AN INVESTIGATION OF AN EPIDEMIC OF CHOLERA CAUSED BY A "CARRIER."—(*Indian Journal of Medical Research*, Vol. I, No. 1, July, 1913.) Greig, investigating an epidemic in the jail of Puri, India, succeeded in tracing it to a pilgrim from the interior, having been infected at Puri during the "Nutan Kalebar" Festival of Jaganath, when about 300,000 pilgrims attended. The native entered the hospital and was later discharged as cured, after a few days was incarcerated in the jail. A few days after his admission cases began to break out in the quarters he occupied, which aroused the suspicion of the author, who examined his stools and discovered the organism in large numbers exactly three weeks after his attack. The following method of isolation and identification was adopted: Part of stool is placed in peptone water and incubated at 37° C.

Digitized by Google

for six hours, then reinoculating a second flask of peptone water and incubating 72 hours at 37° C. A few drops of peptone water are then placed on Dieudonné and plain agar plates incubating 18 hours at 37° C. Suspected colonies are then "fished out" and tested serologically with known sera. Reaction colonies are then subcultured and identified, culturally, morphologically and biologically, thereby insuring the accuracy of the method. The article is interesting and is demonstrative of actual conditions occurring elsewhere, giving us a clearer insight of the importance of "carriers" who do not create the least suspicion of the dangers that follow in their tracks, a problem that is the greatest obstruction to the modern day preventive medicine. P. L. Q.

"ESPASMO TROPICAL." A PECULIAR DISEASE OF GREAT MALIGNANCY, ASSOCIATED WITH A PARASITE IN THE BLOOD.—(*Journal of Tropical Medicine and Hygiene*, Vol. 17, No. 2, January 15, 1914.) Vergne, in a brief article, describes cases of an obscure affection found by him in Porto Rico, which he divides into two forms: form "A," which may be benign or malignant, and form "B," resembling typhus. The benign type of form "A" is characterized by trismus; the malignant type includes the trismus plus marked typhoid symptoms of muttering delirium, low tension and rapid pulse, marked hyperpyrexia, and a dark greenish vomitus; death usually ensues in two to three days. In form "B" (which resembles ordinary typhus) dark spots generally appear, confined to the abdomen, which are slightly raised and do not disappear on pressure; in about three days they become red and later the color changes to bluish. The temperature is high, and pulse of low tension and rapid. Complications of bronchopneumonia and acute endocarditis may supervene. Form "B" is considered as always malignant. The author claims to have obesrved a parasite in the blood of these patients. P. L. Q.

CONCERNING THE SEX AND AGE OF AFRICANS SUFFERING FROM TRYPANOSOMIASIS.—(*Annals of Tropical Medicine and Parasitology*, Vol. VII, No. 2, June, 1913.) Todd, in an analysis of the natives infected with trypanosomes in the Gambia and Congo, reports that the disease is most common in young adults (12-44), most of whom are males, which is most probably due to their outdoor and wandering habits, while the females are mostly confined to the villages. Those whose habitations and occupations confine them to the rivers and streams are more commonly infected than those of the interior, which can be readily explained by the presence of the "fly belts" on the banks. While in the Gambia the disease is not very common, it is practically rife in the Congo (estimated 30% in 1903-05). The children are commonly infected, but individuals past middle age are uncommonly infected, which fact the author explains by a probable existing immunity. P. L. Q.

Digitized by Google

BLOOD CHANGES IN VERRUGA AND OROYA FEVER.—(Transactions of the Society of Tropical Medicine and Hygiene, Vol. VII, No. 4, February and March, 1914, pp. 158-159.) Bassett-Smith in a short article describes the bodies present in the red blood corpuscles, both nucleated and non-nucleated, which were formerly discovered by Barton, and lately found and discussed by Strong and his associates in the Oroya Valley of the Andes. While the two conditions may possibly be distinct, their frequency of occurrence in the same individual complicates their identity as specific infections. The bodies of Barton, commonly known as Barton's X bodies, are curved, rod-shaped or comma-like and are found intracorpuscular. The nucleated red cells also show the infection, containing as high as thirty bodies per cell. The general blood picture is affected in the acute forms, there being a marked decrease in leucocytes, with a great diminution of the red cells, accompanied by poikilocytosis, anisocytosis, polychromatophilia and a decided increase in the nucleated forms.

P. L. Q.

RECENT RESEARCH RELATING TO UNDULANT OR MEDITERRANEAN FEVER. (Transactions of the Society of Tropical Medicine and Hygiene, Vol. VII, No. 4, February and March, 1914, pp. 127-157.) Bassett-Smith gives an interesting account of the latest revelations in Malta fever. Besides being disseminated by goats, other ruminants may spread it, also food, fingers, flies, and even carriers. The specific organism is the *Micrococcus melitensis*, and can be found in the urine, feces and milk; a paramelitensis strain is also encountered in numerous instances. The different laboratory animals, sensitized and non-sensitized, will give the agglutination reaction in varying dilutions, but the results are negative if the serum is heated. Lacto-reactions were made with healthy cows' milk after centrifuging to remove the fat and debris. The extreme pathogenicity of the organism has recently been demonstrated by its ability to produce suppurative arthritis and local abscesses. Treatment, with prophylactic and remedial measures, is considered and the article is admirably discussed by Ross, Anderson, and Charles. Typical temperature charts and a map of the geographical distribution of the disease accompany the paper.

P. L. Q.

ON THE CULTIVATION OF THE COMMA BACILLUS FROM THE LUNG IN A CASE OF CHOLERA.—(*Indian Journal of Medical Research*, Vol. I, No. 2, October, 1913.) Greig gives an account of a case of typical cholera which showed on physical examination crepitant râles over both sides of chest. At the post mortem examination of the lung, sections were taken and put into suitable media under aseptic conditions, and from these subcultures were made in a 4 hour and in another 24 hour. These subcultures were tested with a high title cholera serum and fully agglutinated. The organisms showed the morphologic and cultural characteristics of cholera. Smears made at the autopsy from the congested portion

Digitized by Google

of the lung with proper stains showed the presence of the comma bacillus. Paraffin embedded sections of the right lung showed on microscopical examination the alveolar spaces almost entirely filled with cellular exudation. With special stains the cholera vibrios were demonstrated in the alveolar spaces. There was demonstrated some formation of new blood vessels. Bacteriological examination of the bile of the same patient showed cholera vibrios in this secretion. Vibrios with morphologic resemblance to cholera were demonstrated in histologic examinations of the kidney. The author considers these findings important for three reasons. First, the possibility of the spread of the disease by coughing up exudate from lung containing the vibrios, this being a hitherto unrecognized source of contagion. Second, possibility of explaining the causation of pneumonia in cholera. Third, because it supports the view that the blood is invaded, hence increasing the number of avenues of escape and enabling the vibrios to leave the body through the urine.

R. E. Graham.

Precipitation of Bacterial Protein by Concentrated Salt Solution and Its Relation to the Bacteriological Diagnosis of Cholera. (*Indian Journal of Medical Research*, Vol. I, No. 2, October, 1913.) Major E. D. W. Greig shows the relationship between the agglutination of the vibrios of cholera and their precipitation with solutions of magnesium sulphate in various concentrations. This is accomplished by means of the following reagents: 1st. Eighteen to twenty hour agar cultures of the cholera vibrios are emulsified with 1.5 c. c. distilled water, the coarse particles being removed by centrifuging. The bacteria used in the experiments were cholera vibrios cultivated from various secretions and excretions of patients who were sufferers from cholera. The cholera-like vibrios were obtained from water tanks around Calcutta and from human sources also. 2nd. Concentrated solutions of magnesium sulphate containing the following percentages of magnesium sulphate, 90, 80, 70, 60, and 50. The method is as follows: 0.2 c. c. of the emulsion of the bacteria is placed in each of five test tubes and to these are added solutions of the magnesium sulphate containing 90%, 80%, 70%, 60%, and 50%, so as to make up to 2 c. c. These are kept at room temperature for half an hour. The amount of precipitation is noted in each tube. These bacterial emulsions were first tested against specific serum in dilution of 1-6000 and the reaction noted. One hundred seventy-six cholera vibrios were tested giving the following results: 164 were completely precipitated with 90%; 12 were salted out only in traces, even in 90% concentration. Forty-one cholera-like vibrios were tested. Of these, 27 were not salted out; 8 were salted out only slightly; 6 completely in 90% concentration. The agglutination tests were positive in the case of the cholera and negative in the case of the cholera-like vibrios. The author believes that in certain cases where the agglutination reaction

Digitized by Google

of certain bacteria is doubtful that the precipitation by strong solutions of the salts of the light metals may be of value. The result of the experiments hardly leads to such a belief. R. E. G.

INTRAVENOUS MEDICATION IN RELAPSING FEVER.—(*Bull. de la Soc. de Path. Exotique*, No. 2, 1914.—E. Conseil.) In no disease, probably, has treatment made greater or more brilliant strides than in relapsing fever. Arsenobenzol enables us to obtain, in most cases, the *therapia sterilisans* which is the object sought in all infectious diseases. Neosalvarsan seemed to go a step farther by lessening the violent reaction which usually accompanies 606. The technique of intravenous injection of neosalvarsan, according to Ravant's method, has rendered this treatment easy and applicable in the most distant colonies. However, although it is easy to secure a rapid and definite cessation of the infection in most cases, relapse does sometimes occur. Inversen had four relapses in 52 cases; Paucot had 2 in eight cases; and Smiroff had 17 relapses in 201 cases. M. Mouneyrat has recently brought out two new arsenical compounds under the names of "ludyl" and "galyl," the trypanocide and spirillicide properties of which were shown experimentally to be equal to those of the arsenical compounds of Ehrlich. Starting with this experimental evidence, Conseil resolved to try the two preparations in relapsing fever. He began his observations at the close of an epidemic, and he had opportunity to use the remedies in only ten cases; but the results of the treatment left no doubt as to the efficacy of the remedies. The first patients treated received intravenously from 30 to 50 centigrams of the arsenical compound dissolved in 100 c. c. of distilled water. Later on, M. Mouneyrat put up the remedies in syringes containing 20 c. c., according to the method employed for neosalvarsan. He used galyl six times and ludyl four times. The results were identical in all cases. The reaction following the injection is similar to that of salvarsan. The reaction ordinarily manifests itself in a slight increase of fever for about two hours, then occur vomiting and diarrhea. There is vertigo at first. The urine is uninfluenced. The local pain is nil when the injection is skillfully made. After each injection the spirilla disappear completely from the peripheral circulation in less than nine hours. The fall of temperature coincides with the disappearance of the spirilla. The treatment is efficacious whether applied during spirillæmia or during the period of repose. The sterilization of the organism has always been obtained more rapidly than with arsenobenzol and neosalvarsan, and, above all, in a more radical manner. The author concludes by saying that M. Mouneyrat's two preparations constitute another advance in the treatment of relapsing fever. A. McShane.

TRYPANOSOMIASIS TREATED WITH SUDYL AND GALYL.—(*Bull. de la Soc. de Path. Exotique*, No. 2, 1913.) A. Lafont and V. Dupont draw the following conclusions from their observations: 1st. Albuminuria existed

Digitized by Google

in four-fifths of their cases. The albumen varies from a few centigrams to a gram or more. The urine is often hyperacid. The source of the albuminuria is not clearly ascertained (toxin of the trypanosome, alteration of the renal filter by the trypanosomes or broken-down blood corpuscles). When paludism coexists, it may also cause the albuminuria; but the trypanosome certainly plays a part, for albuminuria is the rule in the animals experimented on. Albuminuria is not a contraindication of intravenous injection. The albuminuria disappears at the end of the treatment, at the same time as the organisms disappear from the blood. 2nd. Coexistence of other diseases, filariasis, paludism, bilharziasis, various cutaneous eruptions, syphilis, etc. In this respect, some of their patients are veritable pathological museums. Sudyl and galyl are without marked action on the microfilaria in sheaths, the movements of which slow down after the injections; their curative action in syphilis is known; their action in other diseases remains to be determined. In malaria, the customary doses of ludyl and galyl seem to be without effect on the plasmodium. 3rd. State of the myocardium. Weakening of the heart muscle by previous illness is the only serious contraindication to intravenous injections; also pericarditis of advanced trypanosomiasis. The temperature before and after the injections is a valuable guide; a prolonged elevation of temperature should make us careful in pushing the treatment, or even continuing it. 4th. Results of treatment. All the patients were cured by the three treatments instituted. Improvement was noted even when the treatment was too feble or too brief. The cure is permanent when the dose reaches 5 or 10 centigrams per kilogram of body weight. The ganglia melt away entirely or nearly so, which, in some cases, become extremely hard; oedemas are absorbed, the strength returns, the weight increases, the patient becomes more cheerful, and they gladly return to work. 5th. Trypanosomiasis is found in family groups. The authors were forced to conclude that something besides the tsetse fly was concerned in disseminating trypanosomiasis. The researches of Raband would go to show that mosquitoes are incriminated at certain times of the year and under certain conditions. A. McS.

THE FUNCTIONS OF A MODERN HOSPITAL.—(R. O. Beard, *The Modern Hospital*, April, 1914, p. 207 *et seq.*) There are four types of hospital to-day:' the small special hospital, the private general hospital, the teaching hospital, the modern public hospital. The evils of each and all should be met by the general hospital, with provisions for all kinds and classes of the sick, including the acute and chronic cases, as well as the contagious diseases. The hospital should be nonpolitical, with nonpartisan board of management, named by the highest and most unprejudiced appointive power within reach. In the city the mayor, and in the country the full bench of district court judges would approach most nearly this quality of selection.

Digitized by Google

The creation of a public hospital is one phase of a social service. A public hospital is not a charitable organization. It is a piece of the mechanism of the balance of social justice. It should be a public health center. It is the high calling, also, of the public hospital to serve as a graduate college of the medical profession. The patients of such a hospital should be expected to give only the *quid pro quo* of an opportunity of medical study which will enlighten the physician and which will enhance his usefulness to the community. Dyer.

ALCOHOL AND TOBACCO RELATED TO LONGEVITY. — (Crothers, *N. Y. Med. Journal*, XCIX, No. 17, April 23, 1913, pp. 826-831.) Alcohol and syphilis are mated in recent consideration of disease and death. Life insurance companies are on the way to solve the problem of alcohol as affecting risks; some companies take a comparative view, while others insure only total abstainers. The activity of the laity has been responsible for scientific investigation of alcohol and tobacco in their effects on the human economy. Most investigators agree that the effect of alcohol is bad. The author summarizes his own opinion in the statement that "alcohol is the most profound degenerative agent, and its use produces distinct diseases and diseases which are as traceable and curable as any other disease." Spirit and drug neurotics are largely confined to two classes, the alcoholic and the inebriate. The former is the moderate drinker, and his type is common. The European alcoholic has low resisting power, and dies suddenly from obscure causes. The post morten shows cirrhosis, sclerosis, and organic change. In this country the alcoholic is less common, as the constant use of alcohol is not so regularly practiced as in Europe. The inebriate is different: the drink craze comes on suddenly, calls for alcohol in any form. The attacks are literally nerve storms, demanding gratification with alcohol. The resisting power of these subjects is also low. When injured or forced to undergo a surgical operation, their vitality is uncertain and low. The alcoholic is toxemic, suffering from autointoxication in addition to that from the toxins of the alcohol. The inebriate is a neuropath and a psychopath, subject to morbid impulses and obsessions, with defective and degenerate brain control. Alcohol is the most distinct and prominent of all the particular causes of death in persons under fifty years of age. The immediate causes include cerebral hemorrhage, heart failure, nephritis, and injuries. The fatalities among the tuberculous, the causal influence in insanity, idiocy, and degenerative diseases, are also chargeable to alcohol in large degree.

Tobacco offers a different field of investigation. Cigarettes are the most dangerous. The combustion so close to the mucous membranes favors the easy absorption of toxic products; the continual accumulation of the alkaloids (nicotin, furfural and aldehydes) falls on the arterial tension and vasomotor centers, then later produces toxemia. Tobacco affects arterial tension, raising it temporarily and then diminishing it. The consequent depression is registered on the motor activities,

Digitized by Google

producing excessive nervousness, loss of control and derangement of nutrition. The later heart symptoms have a more or less common symptomatology. The postmorten appearances in persons who have been large users of tobacco show an atrophy of both cell and tissue, traceable to the use of tobacco. The physiological and pathological effects of tobacco, to a greater or less degree, complicate and increase mortality, and its influence on the active organism is that of a profound, concealed poison, lowering cell activity and brain control. Dyer.

THE PROPHYLAXIS OF MEASLES.—(Ruhrah, *N. Y. Med. Jour.*, Vol. XCIX, No. 17, April 25, 1914, p. 813 *et seq.*) Over 12,000 deaths a year in the United States are due to measles, not counting those deaths attributed to complications, and these figures are based on authoritative returns and do not include the records in those states where statistics are not available. The highest death rate is in young children, from six months to two years of age. More children die in winter and more die in cities than in the country. Death is usually caused by complications, involving the respiratory or gastro-intestinal tract. Little attention is paid to preventing measles; so many children have the disease that among most people it is accepted as a necessary evil, to be endured as soon as possible. This is all wrong. Prompt isolation is usually effective; and the care in preventing exposure of others is also potential. Measles is transmissible from the beginning of the catarrhal symptoms; while measles prevails all children with coryza should be under suspicion and should be kept apart. The lack of proper hospital provision for minor ailments adds to the general spread of measles , and this should be a matter of concern for those engaged in public health. The "box" or cubic separation in contagious wards of hospitals offers a remedy. The early diagnosis is important. One factor of significance is loss of weight, beginning five or six days before the catarrhal symptoms; this may be determined by systematic weighing of all of a group of children; the loss is about three ounces a day for children up to four years of age. Other signs are cyanosis of the tongue as Koplik's spots, which are seen as early as four days and usually two days before the general eruption. General education in public health, tending to separate all well children from children who are in any way sick, will finally help. Dyer.

Digitized by Google

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed.

Thompson-McFadden Pellagra Commission. First Progress Report. Lilly Scientific Bulletin, Series 1, No. 5, April 6, 1914.

PREVENTIVE MEDICINE AND HYGIENE. By M. J. Rosenau. New York and London: D. Appleton & Co. 1914.

This is a book of more than one thousand pages written by a man who stands at the head of the profession in this country as an authority on preventive medicine and hygiene. The author presents in this volume the fruits of twenty-three years of varied experience in public health work. The book is written in text-book style and presents in the most practical way preventive measures against the large list of preventible diseases. In view of the growing importance of this phase of medicine and the practical and thorough way in which it is presented in this book, it will be found almost essential to students of medicine, students of public health as well as to physicians who expect to keep abreast of the advances along this line. It is highly recommended to all such. C. C. Bass.

BACTERIOLOGICAL TECHNIC. By J. W. H. Eyre, M. D., F. R. S. (Edin.). Second edition. Philadelphia and London: W. B. Saunders. 1913.

This is a most excellent presentation of bacteriologic technic. This second edition brings the book right up to date. The latest and most approved methods are described. The author shows originality in the way in which the technic is described and adds very much to the practical value of the book by putting in a good number of first-class original illustrations. Chapters on the technics of bacterioscopical analysis of soil, milk, water and air extend the scope of usefulness of the book to technical students generally and also to hygienists. C. C. B.

MEDICAL ENTOMOLOGY. By Walter Scott Patton, M. B. (Edin.), I. M. S., and Francis William Cragg, M. D. (Edin.), I. M. S. Christian Literature for India. London, Madras and Calcutta, 1913.

This large volume of 768 pages deals intimately with all insects concerning the domain of medicine. The minutest details of anatomy, physiology, and biology of practically every insect known or suspected as vectors of disease and those producing effects independent of organism transmission are sufficiently and thoroughly treated to make it a standard text for all medical men, sanitarians, and entomologists, etc. The most common

Digitized by Google

vectors, such as flies, fleas, mosquitoes and ticks are treated along such broad lines and sufficiently concise as to be grasped with considerable ease by those not thoroughly conversant with simple biology or possessing a thorough knowledge of entomology. While some of the more important species are treated broadly, which may be considered by some as superfluous or redundant, nevertheless those of utmost importance are equally and more fully treated, thereby eliminating the criticism of the former, which although may be found to occupy a position of equality in the future due to the rapid unravelling of the mysteries of our ever-present neighbors—the insect world. The illustrations being exceedingly numerous enhance its valuable teaching properties, making it as useful for the student as the expert. The authors can be congratulated for launching so extravagantly into a field which was given a small position in the past, but its elaborateness will be in a short space of time looked upon as infinitesimal in proportion to what the future has to present when medical entomology will be a special branch of science, requiring experts for the successful accomplishment of results which it is intended to pursue. Suffice it to say that the compensation will soon reveal itself probably a hundred fold. P. L. Querens.

COMMUNICABLE DISEASES: An Analysis of the Laws and Regulations for the Control Thereof in Force in the United States. By J. W. Kerr and A. A. Moll. Public Health Bulletin No. 62, July, 1913. 700 pages.

This volume contains the health regulations of the federal and respective state governments applied to the control of infectious or communicable diseases and public health supervision of foods, water supplies, etc. The powers of the federal government are first considered, dealing with quarantine regulations, biological products, foreign commerce, requirements at foreign ports and at sea, immigration, interstate traffic, etc. The powers and duties of the state health authorities regarding occupational diseases, quarantine, investigations, biological products, hospitals, disinfection, expenses, disease carriers, food, milk, water, school sanitation, public buildings, etc., are taken up. The volume is well written and of exceptional value. P. L. Q.

REPRINTS.

CHALMERS, ALBERT J., and ARCHIBALD, R. G. Two Early Eighteenth Century Treatises on Tropical Medicine. Reprinted from the Proceedings of the Royal Society of Medicine, 1914, Vol. VII. (Section on the History of Medicine.)

GREIG, E. D. W. On the Cultivation of the Comma Bacillus from the Lung in a Case of Cholera. Reprinted from the *Indian Journal of Medical Research*, Vol. I, No. 2, October, 1913.

Digitized by Google

GREIG, E. D. W. Precipitation of Bacterial Protein by Concentrated Salt Solution and Its Relation to the Bacteriological Diagnosis of Cholera. Reprinted from the *Indian Journal of Medical Research*, Vol. 1, No. 2, October, 1913.

MIDDENDORP, PROF. (DR.) H. W. Le Bacille de Koch est une Bactérie innocente se développant dans les cavernes tuberculeuses du poumon, lesquelles ont communication avec une bronche et pas l'agent pathogène de la tuberculose. Paris, 1908.

RUCKER, W. C. Public Health Administration. Reprint No. 171 from the Public Health Reports, March 6, 1914.

SILVESTRI, F. Report of an Expedition to Africa in Search of the Natural Enemies of Fruit Flies (Trypaneidæ). Bulletin No. 3, Division of Entomology, Territory of Hawaii, Board of Agriculture and Forestry, February 11, 1914.

PRINTED AT THE TULANE UNIVERSITY PRESS, NEW ORLEANS, U. S. A.

Digitized by Google

THE AMERICAN JOURNAL OF TROPICAL DISEASES AND PREVENTIVE MEDICINE

CHARLES CHASSAIGNAC, M. D.
ISADORE DYER, M. D. } ..... MANAGING EDITORS

COLLABORATORS

RICHARD P. STRONG, M. D., President, American Society of Tropical Medicine
JOHN M. SWAN. M. D., Secretary, American Society of Tropical Medicine } *Ex officio.*
CHARLES F. CRAIG, M. D., Captain, United States Army Medical Corps.
EDWARD R. STITT, M. D., Medical Inspector, United States Navy.
RUPERT BLUE, M. D., Surgeon General, United States Public Health Service.
ALLEN J. SMITH, M. D., University of Pennsylvania
PAUL G. WOOLLEY, M. D., University of Cincinnati.
CHARLES C. BASS, M. D., Tulane University.

VOL. I. JUNE, 1914 NO. 12.

EDITORIAL

The Phlebotomus Papataci, the Transmitter of the "Three-days Fever."—Dr. Rafael Morales contributes a valuable article to the *Escuela de Medicina* of Guatemala (February, 1914), on the insect that transmits a fever variously known in Central America as the "three-days fever," "estival (summer) fever," "dog-disease," "climatic fever, " "estival or malarial influenza." Dr. Ch. Dopter, of Paris, has given the classical description of that disease. According to Dopter, the characteristic symptoms appear after an incubation of five or seven days. The fever often comes on abruptly, without chill or prodromes. In a few hours the temperature rises to 39°C. There is intense headache; the skin is dry, burning. The face is red, the eyes brilliant, the conjunctivae injected. A diffuse redness invades the buccal mucosa at the level of the cheeks, the gums, the velum palati, the uvula, and the nasal mucosa. The disturbances of

Digitized by Google

the nervous system show themselves, besides the intense headache, in great prostration and marked psychic depression. Sometimes the attack begins so brusquely that the patient is unable to reach his bed, but falls down to the ground, apathetic, moaning, not answering questions; not rarely the patient says he wants to die. At other times, there is syncope, vertigo, and loss of consciousness, or agitation, delirium, and even epileptiform convulsions. At the same time the patients feel violent pains in the lumbar region, the spinal column, in the muscles, and particularly along the nerve-trunks. There is sometimes precordial anxiety, which may be so intense as to compel the patient to walk about his room in spite of the fever and pain. There is loss of appetite; the breath is fetid; the tongue is covered with a whitish or yellowish coating; near the tip, a kind of triangle is observed, with its base directed anteriorly, in which the mucosa has a normal aspect. Vomiting sometimes occurs. The spleen is not enlarged. Bradycardia is met with; with a temperature of 40°C., the pulse is from 70 to 90. There is marked leukopenia; a few hours after the onset, the leukocytes fall to about 3700; on the second day to 2900; after that the figure gradually rises until it reaches the normal. There are traces of albumen in the urine. Indicanuria is found only in those cases in which diarrhea exists. The diazo-reaction is negative. In some cases, erythema appears on the skin of the upper extremities, the back, and the knees; in others, there are urticarious, polymorphous, or petechial eruptions. Herpetic vesicles sometimes develop at the naris, or the angles of the mouth.

All the symptoms reach their maximum in 24 hours; the temperature may rise to 41°C., but it remains at this height only a short time, and then begins to decline. On the second day, all the symptoms moderate, and on the third day the temperature falls to the normal, accompanied by profuse sweating. The bradycardia may persist for six or eight days. Convalescence is

Digitized by Google

slow, showing a marked contrast to the shortness and severity of the fever, though a few cases are very mild.

One attack confers immunity as a rule, though relapses are not infrequent during the first eight days of convalescence.

The clinical picture recalls that of dengue; indeed, Franz and Doerr are inclined to believe that they are one and the same disease. It ought not to be difficult to settle that point; for Dr. J. W. McLaughlin, of Austin, Texas, showed the writer, many years ago, photomicrographs of the causative agent of dengue fever; but Dr. Rafael Morales does not seem to be acquainted with McLaughlin's work.

Morales says that, in Guatemala, it is certain that the *Phlebotomus papataci* is the transmitting agent, the intermediate host, of the invisible and filterable virus that produces the "three-days fever." This ought to differentiate from McLaughlin's bacillus.

Dr. Morales writes primarily concerning the *Phlebotomus*. He had read in a work of Dr. Augusto Emilio Goeldi on the "Mosquitoes of Para," that only two species of mosquito were found in Central America. Goeldi stated that, on the American continent, the following numbers of species of mosquitoes are found: North America and Canada, 37 species; Central America, 2; Antilles, 26; and South America, 46 species. Morales calls attention to the error in this table relative to Central America. He undertook a biological survey, and in a short time and in a limited territory he found the following species: genus *Megarhinus*, 2 species; genus *Janthinosoma*, 1 species; genus *Sabethes*, 1 species; genus *Culex*, several species. Moreover, there were several non-bloodsucking species, like the *Chyronomus*, of the species of which the *Chyronomus calligraphus*, is very abundant in the capital (Guatemala City).

In addition to these varieties, they have a species belonging to the family of the *Psicodidae*, intermediate between *Culicidae*

Digitized by Google

and *Glossinae*. This species is the subject of Dr. Morales' paper: The *Phlebotomus papataci*, a species well known on the coasts of the Adriatic, in Italy, Herzegovina, Dalmatia, Crete, Malta, Egypt, India, Arabia, East and West Africa and Algeria. Until Dr. Morales' paper, this species had not been studied in Guatemala.

Morales found the *Phlebotomus* on a sugar plantation, at an altitude of 1200 feet above the sea. It measures from one and a half to two millimeters in length; and is of a pale straw color, with very transparent wings. Its general form perfectly resembles that of the genus *Culex*, with the following differences: the proboscis is much shorter than the palpi, and the wings are perpendicular to their point of insertion (metathorax), as in the diurnal Lepidoptera. It is very quick in its movements, and silent in its flight; its sting is painful, leaving at first a small red spot like a flea bite, which soon becomes surrounded by a red areola having a radius of about one centimeter, and disappears slowly in about 48 hours. It visits dwellings in the early hours of the night, although it usually bites during the day. The mosquitoes observed by Dr. Morales died shortly after feeding, and, unfortunately, he was not able to trace them to their breeding-pools, or to study their ova and larvae.

A. McShane.

A New Treatment of Cancer.—The surgical aspect of cancer has probably been developed as far as it ever will be; we need not look forward to any striking advances in surgical therapeutics. The medical aspect, however, has lagged far behind the surgical, and not much progress has been made, in spite of the tragic interest that the dread disease has always excited. Our hopes have been raised more than once, only to be dashed to the ground again. The failure of a recently imported remedy is the latest illustration of the hope that springs

Digitized by Google

eternal in the human breast. Among the unrecorded and unsung labors of men who have striven to solve the cancer problem, may be named those of the late Dr. John T. Jones, of New Orleans, with attenuated rattle-snake venom. Among the forty cases (unreported) treated with "crotalin," we have been credibly informed that there were numerous indisputable cases that were cured, or seemed to be cured. These cases deserve to be followed up. Death put an end to Dr. Jones' labors before he had time to write them up.

Now comes Dr. Chas. F. D'Artoid Francis, of Brooklyn, N. Y., who brings forward a "biological" treatment for cancer (*New York Medical Journal,* May 9, 1914). He stresses the oxidising feature of his method, and lays his course accordingly. He reminds us that Bishop and Page, and Hermann, as far back as 1898, found that thyroid gland materially assisted those suffering from cancer. In the *Medical Council* for May 1, 1912, he described an oxidizing mixture that is harmless to the patient, and yet will cure. Nobody could demand any better conditions in any remedy. Thyroid gland fulfills the function of such an oxidizing agent. It increases the nitrogenous and purin output of the body. How this is done has lately been explained by Dr. Slosse, of Belgium, who found that the albuminoid molecules were reduced, or "disaminized," by the thyroid gland.

Dr. Francis claims that thyroid substance, in combination with the deficient salts, hemoglobin and cholesterin, is the rational mode of treatment, operable or inoperable. Ross, of Liverpool, says that kreatin, one of the purin bases, with globulin, prevents the proliferation of the cancer epithelium. Inasmuch as hemolysis is a frequent phenomenon of cancer, Francis used the antihemolysin, cholesterin. He has succeeded in curing about a dozen cases of cancer with the following mode of treatment:

Digitized by Google

Formula No. 1.

℞ Desiccated thyroid gland, 2 to 4 grains.

This should be taken an hour before the following mixture:

Formula No. 2.

℞ Sodium chloride, 2 grams.
Potassium sulphate, 0.070 gram.
Sodium sulphate, 0.063 gram.
Calcium sulphate, 0.075 gram.
Magnesium phosphate, 0.055 gram.
Manganese dioxide (intravenously 0.008), 0.032 gram.
Cholesterin, 0.3 gram.
Hemoglobin, 3.25 gram.
Boiled water, 250 c. c.

Dissolve the soluble salts in the boiled water, filter, then add the other ingredients. This dose should be taken an hour before meals. If the intravenous method be desired, it may be employed, once a day, trikresol being added as an antiseptic (0.2 per cent).

With this mode of treatment one may prevent proliferation of the cancer epithelium and hemolysis, increase oxidation, and favor the action of the protective ferments.

Whether Dr. Francis be right or not in his explanation of the *modus operandi* of his treatment, the big fact remains that it gives results, some of the cases being inoperable cancer of the breast, and others, abdominal (visceral) cancers. If it can be proved that one case of visceral cancer has been cured by medicinal treatment, then a new era may be said to have begun in medical science, and the man who brings it about deserves to take rank with the world's greatest philanthropists.

A. McShane.

The Mexican Situation.—For many weeks past President Wilson has been bitterly assailed by a hostile yellow press and jingo tribe for his attitude of "watchful waiting" with regards to the Mexican situation. It is evident that of those who shout loudest for war and prate about national honor, few, very few

Digitized by Google

indeed, realize the full significance of their demands. To the inquiring and practical intellects of this country, however, the impending war between Mexico and the United States, with its grim ally, pestilence, is viewed with horror and dread, and as something to be prevented at almost any reasonable cost. How greatly would the fervor and "patriotism" of the bellicose be dampened if they only knew that behind the looming presence of war there is the terrible shadow of pestilence! Or rather, we should say the shadows of pestilence; for the two most terrible pestilences of modern times—plague and yellow fever—are again showing signs of an activity which forebodes mischief, it is feared, to the Southern United States; a mischief which can hardly be escaped if this country should be plunged into a long and disastrous war—a conflict which would seriously threaten the health of the South Atlantic and Mexican Gulf ports.

Again, it must be remembered that a United States soldier is an expensive article under the most favorable circumstances; even though he never leaves our shores. The cost of his education, equipment and maintenance is so great, and the loss of all expended on him so entire when he dies, that any neglect of his health is wicked and wasteful improvidence. Terms far stronger than these would scarcely express the iniquity of ruthlessly exposing him to enemies more dreaded than the sword—the pestilence that walks in the darkness, and the enervating heat of a tropical sun.

The brief, though almost daily, announcements in the lay press of the appearance of plague in various spots of the American tropics and West Indies, and that the disease is increasing, generally convey to the ordinary reader a very insufficient impression of the serious crisis of which, in fact, these announcements are but indications.

The recent request of Secretary McAdoo, on behalf of the Public Health Service, that Congress "make instantly available"

Digitized by Google

$100,000, to prevent the spread and introduction of epidemic disease into the United States, is amply demonstrative of the great anxiety entertained in official circles with regard to some of the terrible consequences of armed strife. Since the renewed development of plague in Cuba, after more than a year's dormancy, it is manifest that the disease is exhibiting a growing disposition to spread over larger areas, always coming closer to New Orleans, Mobile and Galveston.

It will be obvious that should the United States be plunged into war with Mexico the condition of things favoring the development and dissemination of plague in this country may be indefinitely aggravated.

The prospect of yellow fever would appear to be not less gloomy than that of plague. Indeed, as the more modern pestilence and the one with which we are best acquainted, and in a better position to estimate its possible ravages, the prospect as to yellow fever may be said to be gloomier. We have more definite knowledge as to this subject, in consequence of the weekly reports of the Public Health Service—and these reports are not at all reassuring.

The danger arising from the introduction of smallpox and typhus fever into the Southern section of the United States is greatly augmented through the arrival of Mexican refugees at Galveston and New Orleans.

The medical mind best appreciates the horrors of war and for that reason deplores its occurrence. War has for its object the destruction of the species. The mind of the warrior teems with machinations of ruin, and anxiously resolves, amongst different schemes that present themselves, which will carry destruction to the widest extent and with the surest aim! War means devastation and blood, depopulated fields and smoking villages. The laurels worn by the warrior are always bedewed with the tears of widows and orphans. The acclamation which

Digitized by Google

the conqueror wins from one portion of his species, is answered by the curses and execrations of another; and the delusive splendor, the proud and imposing array, with which he contrives to gild the honors of his profession are but the pomp and retinue of the Prince of Terrors. Disease, the warrior's faithful ally, is the King of Terrors.

The "watchful waiting" policy of President Wilson is, despite the cavil of jingoes and political mal-contents, to be applauded, as it, in all probability, means the deliverance of this country from a most frightful visitation of epidemic disease.

Fames, pestis, et bellum, populi sunt pernicies!

Howard D. King.

The South African Anti-malarial Association.—The Home of the Free and the Land of the Brave cannot boast of the best of everything. There are remote corners of the earth from which she might learn useful lessons.

The publications of the South African Anti-Malarial Commission have been received. These consist of ten pamphlets and leaflets for popular distribution, the Report of the Executive Committee, and the Proceedings of the Third Annual Meeting, and an illustrated wall card, 20x12½ inches, portraying graphically and simply the rudiments of malaria prophylaxis.

The objects, methods and organization of the Association are stated in the Proceedings as follows:

1. Object: The prevention of malaria.
2. Methods—
   - I. The education of public opinion by means of
     - (*a*) The dissemination of information as to the cause and method of prevention of malaria by means of pamphlets and otherwise amongst farmers and others.
     - (*b*) Coöperation with other associations having similar objects.
     - (*c*) Public lectures by men approved by the Council.

Digitized by Google

(*d*) The coöperation of the public press.

(*e*) Periodical congresses and the publication of an annual report.

II. The establishment of local and affiliated associations.

II. The influencing of parliament, agricultural associations, and other public authorities, on matters relating to the prevention of malaria.

3. Membership: Membership of the Central Association is open to any person who contributes the sum of 10 shillings annually. In districts where a local association has been formed, persons desirous of becoming members are requested to join such local association. Local associations have been formed at Zoutpansberg and at Barberton.

How to Form and Carry on Local Anti-Malarial Associations amplifies the following definite program:

1. Secure the coöperation of the local paper.
2. Form a little bit of a library.
3. Form a ladies' section.
4. Approach the local authority tactfully.
5. Suggest to the licensing court to require hotel keepers in malarial sections to mosquito-proof their premises.
6. Insists upon the subject being taught to the children in the schools.
7. See that the publications of the South African Anti-Malarial Association are distributed to the best advantage throughout your area.
8. Distribution of quinine.
9. Act as a vigilance committee to see that government provides its servants, railway men, police, and so forth, with mosquito-proof dwellings where malaria prevails.
10. Organize lectures.
11. Get the local troop of boy scouts interested in searching for and destroying wherever possible the breeding places of mosquitoes.

The Anopheline Mosquito, written by Dauglish and containing facts and information for use in schools is an attractive pamphlet of 28 pages, appropriately illustrated by halftones, bound in heavy ornamental paper and written in popular style.

Digitized by Google

It seems ideal for its purpose and might well be adopted as a textbook in every school in malarial localities.

A Summary of Facts Regarding Malaria, Suitable for Public Instruction, by Ross, is a companion piece to the above, being adapted for adults. This pamphlet takes up: 1, The parasites and the fever; 2, the mode of infection; 3, facts about mosquitoes; 4, personal prevention, and 5, public prevention.

One of the most useful pamphlets is Mosquitoes and Malaria by C. J. Faure, Division of Entomology, Union of South Africa. This is translated also into Dutch. It covers the rudiments of etiology, prevention and cure of malaria and is attractively illustrated.

Leaflets entitled Malarial Fever, by Ross, and Fever on the Farm, by Hay, are prepared in English and Dutch. The Conquest of Malaria is a popular interview from General Gorgas.

The Secretary of the Association is Mr. W. A. J. Cameron, P. O. Box 2879, Johannesburg, South Africa.

Altogether these articles constitute the most valuable literature for proper enlightenment on malaria that has ever been prepared. *Wm. H. Deaderick.*

Digitized by Google

ORIGINAL ARTICLES

SOME FURTHER REMARKS ON BERI-BERI.

By

EDWARD B. VEDDER,
Captain, Medical Corps, U. S. Army.
From the Laboratory of Pathology, Army Medical School.

1. A consideration of some instances recently reported, in which it is claimed that beri-beri has occurred on a liberal and varied diet, thereby disproving the theory that beri-beri is due to a dietary deficiency.

In a recent publication[1] it is maintained that beri-beri is a disease resulting from faulty metabolism, *usually* only seen in in those persons who eat rice as the staple article of diet, and is directly caused by the deficiency of certain vitamines in the food. During the past year, a number of articles have appeared from authors who have cast discredit on this proposition, either by denying it in toto, or by claiming that while Oriental beri-beri may be due to dietary deficiency, there are different forms of beri-beri, some of which are due to other causes.

I believe that beri-beri is caused solely by a dietary deficiency, and that it is therefore always preventable, and should be prevented. It is apparent that if this belief is correct, such articles do a great deal of harm by confusing the minds of the very sanitary authorities in whose hands the prevention of this disease must rest. That such confusion actually exists may be seen from the following statement by Lukis[2], who says "Beri-beri is not included in our agenda, but Dr. de Mello in his paper upon 'The Notification of Disease' expresses the opinion that beri-beri cannot be attributed to rice. On the contrary he believes it to be infectious and contagious. That he is not alone in this opinion is evidenced by the fact that during the last year communications have poured into the medical press, notably from the Amazons, Brazil, Southern Nigeria, and Shanghai, in all of which the authors express grave doubts as to the accuracy of the deficiency theory, and I am informed by Colonel Blenkinsop, R. A. M. C.,

Digitized by Google

that, when he was in Sierra Leone he had under his care several British officers suffering from clinical beri-beri. A few months ago, moreover, there was an outbreak of peripheral neuritis, closely resembling beri-beri, amongst the British troops at Lebong. None of those attacked were rice eaters, and the majority of them were total abstainers."

It is one of the purposes of this paper to discuss several of these articles, and to show that they afford no evidence which conflicts with the deficiency theory.

Lovelace has published two papers on the beri-beri in Brazil[3] [4]. In the latter paper he comes to the following conclusions:

1. Among the 963 cases of beri-beri to which reference is made, were many in which the factors of defective diet and of a rice diet could be positively and definitely excluded. This is in line with the reports of many observers in many parts of the world.

2. The experiments of Fraser and Stanton, confirmed by other workers, are conclusive to the effect that the beri-beri symptom complex may be induced by a diet of polished rice.

3. As a corollary from these two conclusions, and considering the multiplicity and diverse characters of the agents that are known to cause multiple neuritis, it is highly probable that the term "beri-beri" is one that has been used to cover not a single disease, but a group of diseases, more or less indistinguishable clinically.

4. The question of the etiology of beri-beri cannot yet be regarded as settled.

The evidence that Lovelace produces upon which conclusion 1 is based, is furnished chiefly in his first paper[3]. It may be admitted that upon a first reading, especially to one who is not familiar with the experimental work that has been done on beriberi, including polyneuritis gallinarum, this evidence appears to prove that beri-beri may occur among individuals subsisting upon a perfectly satisfactory diet. A critical examination of this evidence however, will show that no proof is presented that any individual who developed beri-beri actually received a satisfactory diet. In criticising this evidence, we may consider the following points:

1. Lovelace makes quite a point of the fact that numerous cases of beri-beri occurred on a diet from which rice was absolutely excluded. This fact, which we do not question, is of little importance. A diet consisting chiefly of rice is the diet which ex-

Digitized by Google

perience has shown is most frequently followed by beri-beri, but it is not postulated as being essential to the causation of beri-beri. Any other diet in which a deficiency of the proper vitamines exists will serve equally well.

2. Lovelace says "alarmed at the increase of beri-beri among our employees of all classes, we caused rice to be eliminated from all company messes and removed from all the commissaries. *In lieu of rice we furnished macaroni.* The staple foodstuffs of the laborers were made to consist of dry biscuit, meat (dried and tinned meat and codfish), beans and macaroni, instead of dry biscuit, meat, beans and rice." Beri-beri continued unabated. Lovelace evidently assumed that "the factors of defective diet and of a rice diet could be positively and definitely excluded" in this case, but this is far from correct. Dry biscuit and macaroni are made of white wheat flour which has already been incriminated[5 6 7], and the meat was dried or tinned. Every article in this ration was, therefore, a beri-beri producer, except the beans, which were probably consumed in insufficient quantity to neutralize the great deficiency existing in the remainder of the ration.

3. Lovelace states that there were twenty-four cases of beri-beri among clerks, mechanics, camp foremen, timekeepers, etc. "Their diet here would not have suffered in comparison, as to quality, quantity, and variety with the diet of persons similarly employed anywhere in the United States. Fresh meat, onions, potatoes, *and an abundant supply of the best American tinned meats, fruits and vegetables, were supplied in lavish profusion.*"

It has been conclusively shown, as has been pointed out elsewhere[1], that tinned foods must be sterilized, and that sterilization of food destroys the beri-beri preventing vitamines. The majority of the better class employees escaped beri-beri, for there was a total of 690 admissions to hospital amongst these men, of which only 24 were due to beri-beri. Is it not quite possible that these 24 cases, because of personal idiosyncrasy or exigencies of their service, lived chiefly upon white flour and canned goods? There is not a single word in Lovelace's account to prove the contrary. Lovelace states that the Madeira-Mamoré Railway, on which these men were working, is 227 miles long,

Digitized by Google

and that the nearest city and base of supplies is Manaos. Those who have had the experience of living in the interior of tropical countries know only too well, that fresh meat and fresh potatoes are luxuries, obtainable on occasion, but that the bulk of the diet of Europeans and Americans under such situations is composed of flour in some form and canned goods. There can be no doubt from the account of Lovelace, that fresh meat and vegetables were supplied, but there is no evidence that they were supplied in sufficient quantity; and particularly no evidence that they were actually eaten in sufficient quantity by the men who subsequently developed beri-beri.

Lovelace was apparently in complete ignorance of the facts that a too exclusive diet of wheat flour will produce beri-beri, and that a too exclusive diet of sterilized foods will produce beri-beri. These fallacies run throughout his entire argument and completely vitiate it.

Lovelace admits that it has been proven that Oriental beri-beri is due to dietary deficiency, but argues that since this was not the cause of his cases, there must be two kinds of beri-beri. This conclusion, which has evidently been accepted by several workers[8], obviously has no foundation if Lovelace's cases were really due to dietary deficiency.

When it is once admitted that the cause of a disease is known, subsequent observers who claim that it may also have a second and entirely different etiology, must furnish very complete proofs. All will agree that if it were claimed that malaria could be transmitted in the food, this claim would be ignored unless the most positive and specific proof were afforded. Yet we can all remember the days when the etiology of malaria had been completely worked out, but before this information had been so generally accepted as it is to-day. At that time, it was by no means uncommon to find in the literature, reports of malaria originating on shipboard or in other locations where there were no mosquitoes. A more careful examination always revealed mosquitoes which had been overlooked, or proved that the malaria had been contracted elsewhere. Admitting that Oriental beri-beri is caused by dietary deficiency, no other causation of the beri-beri in other parts of the world should be admitted un-

Digitized by Google

til it has been proved up to the hilt. Experience has already shown that it is quite as easy to overlook a deficient diet, as a few mosquitoes concealed in the cargo of a ship. At the present time, when yellow fever breaks out on shipboard, the ship is fumigated to destroy mosquitoes, regardless of the statement of a medical officer to the effect that there are no mosquitoes. We have now reached a stage in our knowledge, when the occurrence of beri-beri should be followed by a swift change in the diet used.

In a quite recent article, Arnold[9] argues that beri-beri is infectious. In his argument to show that diet plays no part in the causation of beri-beri, he quotes two instances. One of these is a case of ship beri-beri. Arnold says, "No doubt salt beef and pork as the staple article of diet is not ideal, but fresh bread was served every day, and preserved vegetables and lime juice were issued at regular intervals. Rice was not eaten. A monotonous fare made up largely of preserved provisions may be looked upon as a predisposing cause of ill health, but there are no grounds for going further in the present instance." Let us hope not. I believe it has already been amply shown that a diet of preserved meats and vegetables with bread will produce beri-beri, and that no further discussion of this point should be required.

Arnold also says, "The epidemic which occurred on this island (St. Helena) in 1901, amongst the Boer prisoners of war, was certainly not attributable to diet. Rice formed no part of the diet, which was in every particular a liberal one." This statement, that the Boer prisoners received a proper diet, has been frequently made, and so far as I am aware has never been challenged. It will be well therefore to investigate it. The best account of this epidemic among the Boer prisoners of war is by Morse[10]. With regard to the diet of these prisoners, Morse says:

"The dietary of the prisoners has been ample and excellent, practically the same as that of the troops. Vegetables were for a time difficult to obtain locally, but representations having been made to the War Office on this point, supplies of potatoes and onions have been regularly sent from England by the weekly cattle boats and issued at first twice weekly, latterly four times a week. Whenever fresh vegetables have not been available, compressed vegetables, of which there has been an unlimited

Digitized by Google

supply, have been regularly issued. An abundance of lime juice has been available, and large quantities have from time to time been issued on the recommendation of medical officers. I do not believe that food has had any connection whatever with the outbreak, or troops on a similar dietary should have suffered, whereas they have been free from the disease."

There are several points in this account which are at variance with the statement that the dietary was ample and excellent. It is admitted that there was a scarcity of fresh vegetables sufficiently acute to demand representations to the War Office. For a time therefore, the length of which is not stated, no fresh vegetables were issued, and for a further period they were only issued twice weekly. During this time compressed vegetables were regularly issued. No one will claim, however, that a prolonged use of compressed vegetables constitutes a satisfactory ration. The surgeons in charge themselves did not think so, for *large quantities of lime juice were issued on their recommendation.* Now lime juice is added to a ration for just one reason, namely the prevention of scurvy, long known to be caused by a dietary deficiency. The addition of lime juice to the ration on the recommendation of the medical officers constitutes an admission on their part that the diet given the Boer prisoners was deficient, although they do not appear to have realized the import of this admission. Now if the diet was so defective that scurvy might have occurred, how can it be possible to state that the diet was so ample and satisfactory that beri-beri could not have been due to it? The statement that the food had no connection with the outbreaks, or troops on a similar dietary should have suffered may be answered as follows:

1. It is probable that the Boers had been on a scanty and unbalanced ration for some months prior to their capture, whereas the British troops may have been well fed during this period. In this case the Boers would have succumbed to deficiency diseases much sooner than the British troops even though they lived on precisely the same food.

2. There is no evidence that the troops did live on exactly the same ration for the following reasons: (1) When the supply of fresh vegetables, etc., became short, it is reasonable to suppose that the prisoners of war felt the effects of this shortage sooner than the troops. (2) The Boers were prisoners. As such

Digitized by Google

they all remained in one place, under guard, and upon the same diet for the entire period. The troops may have come and gone. There is nothing in the account that specifically states that the troops remained on the poor diets long as the Boers. (3) Even if this were really the case the troops were free to come and go, and could purchase any food they pleased that was obtainable in addition to their rations. The Boers as prisoners of war, presumably were unable to do this.

Fenton[11] has reported beri-beri under circumstances where the diet appeared to him to be satisfactory. He says:

"Now during ten years of residence in Southern Nigeria, I saw a number of cases of beri-beri. Of these, however, four stand out clearly in my memory; they were young Englishmen whose houses I visited every day, with whom I, on numerous occasions, had lunch and dinner, as the case may have been, and consequently whose mode of life I was thoroughly acquainted with. With regard to these cases I can guarantee that they lived as well as any ordinary young men would live in England. There was at all times an abundance of fresh food on the table; chicken, mutton, fish, fruit and vegetables were always at hand, and although they may have had a little polished rice with curry occasionally, they had no greater percentage of it than any ordinary person in England. One of these patients died; the others recovered on going home. I would beg some of the recent schools of tropical pathology to give an explanation of the above cases."

It is impossible to give a categorical answer to this question for the reason that Fenton gives far too little detail. It is possible that these cases were erroneously diagnosed beri-beri. But, granting that they were true beri-beri, his statements as to the diet eaten are all general and not specific. It is impossible to be certain from such an account, which was written apparently some years after the facts were observed, that any of these cases actually ate a satisfactory diet even though it may have been on the table. It may be further pointed out that it has been definitely proven that the quantity of beri-beri preventing vitamines present in different foodstuffs varies greatly. These vitamines are practically absent in onions, and probably in some other vegetables and fruits. Moreover they vary in different meats. It is admitted that these men used rice and probably flour as food. They also probably used a certain proportion of canned or otherwise preserved foods, unless Nigeria is different

Digitized by Google

from all other tropical countries. If a deficiency in beri-beri vitamines was thereby created, it by no means follows that they ate the right kind of fresh vegetables and in sufficient amount to make up for this deficiency.

Stanley[12] has recently written that:

"After a period of close observation extending over fifteen years in Shanghai and other parts of China, beri-beri is found to be common in institutions, such as gaols, charitable institutions, and schools, where large numbers of persons live together, but comparatively uncommon among the general population; practically no difference obtaining as regards the food supply, *at any rate as regards the kind of rice consumed* (italics ours), which is invariably decorticated by the same process in China. If beri-beri were due to the loss of something in the outer covering of the rice grain, why should the disease show such a marked proclivity towards persons closely aggregated in large numbers? Such are the conditions which make for the spread of infection."

The fallacy of this argument has already been so fully explained[1] that it would be unnecessary to answer it further, were it not for the fact that Stanley goes on to say, "But to accept the 'rice theory' as final and to advise governments to legislate against rice with a view to prevention of beri-beri is to discourage further research until, of course, such legislation is found to be futile. Meanwhile, trade may be damaged and the habits of the people unnecessarily interfered with." It is this unfortunate tendency to oppose real sanitary reform which makes it necessary to refute such arguments. The people who are free in the community are able to choose their own food, and as a result the majority of them eat sufficient other food in addition to their polished rice to preserve them from beri-beri. When, however, they are confined in jail or other institutions, and obliged to eat whatever ration is provided, they often receive too large an amount of this overmilled rice in proportion to the other kinds of food supplied, and therefore promptly succumb to beri-beri. A deficient dietary, and not overcrowding is the cause as is proven by the combined experience of all those students of the problem who have been willing to substitute an undermilled rice for the overmilled rice, or who have introduced other rational changes in the diet. Clarke[13] has also answered Stanley's statements very conclusively.

Smith and Hastings[14] have reported multiple neuritis which

Digitized by Google

was probably beri-beri among British soldiers at Lebong. With regard to the dietary they say, "All the men had their rations, supplemented by suppers from the regimental supper bar. The suppers consisted of meat cutlets, liver, fish, pies, etc. The vegetables supplied were fresh. Rice was rarely eaten more than twice a week. It was not the polished variety. Flour was used in bread, in puddings and in pies." They are sure that these cases were certainly not ascribable to diet. With regard to these cases we may say:

1. That we do not know what their ration was. It is naturally assumed by these medical officers that it was satisfactory, but this by no means necessarilly follows. American medical officers, a few years ago would have insisted that our ration issued to Philippine scouts was satisfactory, but we now know that it was far from satisfactory. The tendency to assert that the official ration is satisfactory will be commented on elsewhere.

2. The statement is made that all the men had their rations supplemented by suppers, the components of which sound liberal enough. While these suppers were of course furnished as stated, can it be affirmed that the particular men who suffered from multiple neuritis actually ate these articles. The information on this point is too vague.

3. It is stated that the staple of diet was white flour, which has been shown, when used too exclusively, to be quite as capable of producing beri-beri as rice.

4. It is not stated what proportion of the ration consisted of canned foods.

5. The period of incubation of beri-beri is long—approximately 90 days. It must not be forgotten therefore that it is not the present diet that needs investigation, but the past diet. The fact that this disease is epidemic at some seasons and absent at others, suggests that at corresponding seasons, prior to the outbreak, there is a scarcity of certain vegetables or foodstuffs which, being supplied at other seasons act to prevent beri-beri. Priest, in a later communication describes this multiple neuritis at Lebong[15]. He makes the same statement, that the rations were always of a good quality and varied, but also says, "Unsound fish was never consumed, only reliable tinned fish from the coffee

Digitized by Google

shop was procurable." From this statement it is evident that canned foods were used. There is absolutely no evidence furnished as to what proportion of the ration consisted of either flour or canned food. In the absence of this information, the dietary origin of this beri-beri cannot be regarded as disproven.

From the above discussion we may draw the following conclusions:

1. None of these cases disprove the contention that beri-beri is caused by a deficiency in the diet, i. e., that it is a deficiency disease.

2. It has been completely proven by the experiments of Fraser and Stanton[16], Strong and Crowell[17], and many other observations recorded elsewhere[1], that beri-beri is directly due to a deficiency of vitamines in the diet.

3. If it is regarded as proved that beri-beri is due to a dietary deficiency, it is unscientific to assume that there may be other forms of beri-beri having a different etiology in the absence of definite proof, and without a most careful and rigid study of the dietary used prior to the appearance of the disease.

4. It will not be sufficient in the future, in attempting to disprove the dietary origin of beri-beri, to make statements that the diet was liberal and varied. Any such communication, to be worthy of attention, should contain a detailed statement of the food actually consumed by the affected persons, for the 90 days prior to the development of the disease, showing components, quantities, and a statement as to whether the articles used were fresh, canned, or otherwise preserved.

II. Beri-beri in Jails and Institutions in the United States.

Beri-beri has been reported several times in jails and institutions in the United States. In nearly every instance it is frankly stated that the disease had been present for months or years before being recognized. This is not astonishing, since comparatively few physicians in the United States have seen and studied beri-beri, and even those that have seen it have been accustomed to think of the disease as belonging to the tropics and have not been looking for it in their own practice. From these considerations it appears quite probable that beri-beri may have occurred

Digitized by Google

in institutions in the United States much more frequently than it has been reported or than is generally supposed.

In nearly every such instance in which beri-beri has been reported, it has been stated that the food was satisfactory. There is evidently, therefore, a close resemblance between the epidemics of beri-beri occurring in various parts of the United States, and the epidemics occurring among British soldiers, Boer prisoners of war and the other instances that have been discussed in the first part of this paper. It should be interesting therefore to review briefly the accounts of some of these epidemics to determine whether the diet was really as satisfactory as it was supposed to be.

The first of these epidemics, of which I have any information, occurred in the Alabama Bryce Insane Hospital at Tuskaloosa and was reported very fully by Bondurant.[18 19] In the very full account given in these papers Bondurant states that in this hospital during a period of ten years ending February, 1895, there occurred not more than half a dozen cases of multiple neuritis, and all of these with two exceptions were alcoholic or syphilitic: of these exceptions, one was due to injury and one to pressure of an aneurism. In February, 1895, a case of multiple neuritis developed in a white female patient without assignable cause, and this was rapidly followed by other cases, so that from 1895-96, there were 71 cases of beri-beri among a total population of 1200. The cases were distributed throughout the institution, but a most remarkable feature was its peculiar distribution among the several classes of insane patients. Every one of the 71 patients attacked was the subject of some psychic degenerative form of mental disorder. It was not the physically but the mentally enfeebled who fell victims. Thirty-two of 50 epileptics developed beri-beri, and the remaining 39 cases occurred in imbeciles, paranoiacs, and terminal dementia. Bondurant states that the diet was satisfactory but does not say what it was. He does, however, admit changes in the ration prior to the epidemic. Thus he says, "At the time the outbreak occurred, the food supply was amply sufficient in quantity and fulfilled all of the requirement of a liberal dietary. There was no excess of starchy food. There had during some years, been a

Digitized by Google

gradual improvement in the quality of the supplies purchased, and in the cooking and serving of the food, and the dietary of 1895-96 showed a distinct improvement over that of any preceding year in the institution's history."

There was, therefore, a change in the diet just preceding the epidemic. It was thought to be a change for the better, but from what we have already seen, it might have been the introduction of a supposedly better bread, i. e. white bread, or of many canned articles of diet. Such a change might readily have resulted in beri-beri especially among the class of insane who suffered, since as a result of their mental condition they may not have eaten a proper diet unless carefully supervised, even if a proper diet were furnished.

A severe epidemic of beri-beri occurred in the Texas State Lunatic Asylum at Austin, in 1907. The following letter from the acting superintendent, Dr. Bradfield[20], is believed to state the important facts:

October 17, 1907.

Texas State Journal of Medicine:

About the first of July we first noticed an epidemic of beri-beri in the State Lunatic Asylum, and within a few days we had 100 cases, many of them severe. They all had characteristic symptoms of beri-beri as described in the Tropics. The peripheral neuritis was marked, and soon paralysis of the extensor muscles and the lower extremities would come on, and in the cases where death occurred, it was due to paralysis of the heart or of the respiration. We had both atrophic and dropsical forms, but the dropsical form largely predominated. We had all told about 170 cases, with 17 deaths.

Dr. Warsham says that ever since he has been connected with the institution, he has noticed each summer a few cases of dropsy, beginning in the feet and legs, presenting symptoms of peripheral neuritis. All of these cases recovered, however, and there was nothing to indicate an infectious disease. The cases we had, we attributed to a lowered vitality, a disturbance in the vasomotor system, together with sedentary habits, and want of a proper amount of physical exercise, etc. This summer, however, has been extraordinarily dry, and the patients were deprived to a great extent of the liberal vegetable diet, and we had to rely mostly upon rice, grits and other cereals. As soon as the trouble was diagnosed, isolation was practiced, and liberal vegetable diet procured, while rice, grits and other cereals were cut out entirely, the result being an immediate improvement in the condition, and we are now practically free from it. No

Digitized by Google

nurse or employee in this institution suffered from any symptom of the disease.

Very respectfully,

J. W. BRADFIELD,
Acting Superintendent.

Here we have a case where the diet was chiefly rice, grits, and cereals, and when these articles were eliminated, the beri-beri disappeared. It would seem that further comment is unnecessary in this case.

Beri-beri has apparently occurred quite frequently among the prisoners employed in chain gangs in the vicinity of Charleston, S. C., and has been reported by at least three observers.[21] [22] [23] All three of these accounts describe the same epidemic, and it will therefore be instructive to compare them. The fact that beri-beri has been quite frequent is shown by the following statement from Jervey's account[23]:

"For two years I have attended the county chain gang in Charleston, and during that time have seen three distinct outbreaks of what I now know to be beri-beri, numbering in all thirty cases. In talking with the physicians who attended the stockades before me, and in looking over their weekly sick reports, I find that there were numerous and undoubted cases of beri-beri, called by various names, such as malaria, acute nephritis, cellulitis of the legs, myositis, undiagnosed, swollen limbs and dropsy. Several years ago, four deaths were reported by the stockade physician at one of our medical society meetings, and it was suggested at that time that the disease might be beri-beri."

The fact that this disease was really beri-beri is amply demonstrated in these three papers. With regard to the food supplied, Jervey says, "A good and bountiful supply of rations is provided, consisting of fresh and salt meats (butts), hominy, corn bread, a good grade of molasses and white beans, but no rice. Average number of convicts about 30. Among guards, who numbered six, there has never been a case." With regard to the same epidemic, Sams[21] says, "The food given the convicts is stated to be good and sufficient in quantity and quality, the usual cereals, fresh vegetables, meat daily, salt and fresh on alternating days. The guards have practically the same rations."

Again with regard to the same epidemic, Butler[22] says, "They had been fed on hominy, corn bread, butts meat, beans on Sundays, and rice on Christmas. They claimed they had gotten no

Digitized by Google

vegetables other than the beans on Sunday. They had also been given beef (tainted) once or twice a week."

This is what we have met with constantly in the investigation of obscure outbreaks of beri-beri, and is absolutely typical of the manner in which the etiology of the disease has been confused. No two of these accounts as to the diet furnished agree exactly, and it is probable that no one of them is absolutely accurate. Both Sams and Jervey regarded the food as good in quality and bountiful in quantity, and their evidence would convince many readers that food could be eliminated from consideration as a causative factor in beri-beri. But Butler states that they had beans only on Sundays, that they had no other vegetables. that the fresh meat supplied was tainted, and therefore probably seldom eaten in sufficient amount. These convicts were apparently fed, therefore, chiefly on hominy, corn bread, and salt meat. This is a diet which experience has amply demonstrated will produce beri-beri.

Finally, I wish to quote a recent epidemic of beri-beri occurring in a jail at Elizabeth, N. J., and reported by Parker.[24] In this case beri-beri existed over a period of three years, during which time 22 cases occurred, almost entirely among the long-term prisoners. At least 80% of all prisoners serving more than 90 days contract the disease. This statement is exceedingly significant, since it has now been proven by actual experiment that the incubation period of beri-beri is about 90 days. That is, a beri-beri producing diet must be consumed for about 90 days before symptoms of the disease appear. Obviously, therefore, the short-term prisoners who serve less than 90 days all escape. But if the disease were infectious, there was no reason why these short-term prisoners who serve one or two months, should not become infected.

Parker says nothing in his report with regard to the diet furnished. I, therefore, wrote to Dr. Livingood, the jail physician, who very kindly supplied the desired information. The diet used was as follows:

Breakfast: Coffee, bread, cereal, molasses.

Dinner: Soup (chowder, meat), bread or gruel, some vegetables freshly cooked.

Digitized by Google

Supper: Coffee, bread, cornmush, molasses.

Boiled rice was the exclusive meal twice a week and was also used in the soup.

It will be seen that the diet consisted chiefly of white bread, with rice and corn products, all beri-beri producers. The rice has now been eliminated, and the diet otherwise considerably improved, and it is believed that there will be no more beri-beri in this institution, but the change has been made too recently to afford any evidence on this point.

It appears that we may conclude from the evidence presented in all of the epidemics referred to that in the future, in discussing the etiology of beri-beri in a given instance, the mere statement that the diet furnished was ample both as to quantity and quality, should be given no weight for the following reasons:

1. The persons responsible for the diet used, will naturally state that it was sufficient. They were responsible for its use, and therefore, undoubtedly thought it was satisfactory. Even when a diet is known to be unsatisfactory, it is a rare thing for the authorities of an institution to make public acknowledgement of the fact, although they will sometimes admit it in private.

2. In the past it has not been the fault of physicians that beri-beri has resulted from a deficient diet. Physiologists and dietetists have taught that a diet was satisfactory if it contained a sufficiency of fats, proteids, carbohydrates, salts, and calories. The jail or institution physician, where funds are at a minimum, could not be blamed if he prescribed a diet which, though limited, was in accord with expert opinion as to the food components necessary to maintain health. The fact that we are only in the infancy of our knowledge with regard to bodily metabolism and the diet essential to maintain it, does not appear to have been recognized. We do not yet know with certainty all the important chemical constitutents of a single foodstuff. A single quotation may make the depth of our ignorance clear. Alsberg[25] said recently, "It must be admitted that, at present, we know only those chemical substances occurring in considerable amounts in such important grains as wheat and corn. The minor constituents in grains of much importance have not been identified with

Digitized by Google

exactness. If we consider grains of less importance, even this degree of knowledge can not be claimed."

In the future it will undoubtedly be different. Beri-beri and scurvy have been proven to be due to a diet deficient in certain chemical substances, present in foods in varying but minute amounts, and which have been called vitamines. It is quite possible that pellagra and a number of other diseases may have a similar causation. There are many facts that indicate that pellagra may be a deficiency disease, some of which are as follows:

1. It is a disease intimately associated with poverty and poor diet. It occurs frequently in institutions, in which the diet is by no means above reproach, and rapidly disappears when a liberal diet is furnished. Among the people at large, its distribution is chiefly among the poorer classes, and except for scattering cases, is chiefly confined to those localities where corn is a staple of diet. From the earliest times many have claimed that this disease is associated with a corn diet, and the Italian investigators have never given up this belief.

2. It has been repeatedly pointed out, that cases of pellagra have frequently occurred among those who have not used corn in any form, while on the other hand, many who habitually use large quantities of corn never contract the disease. It must be remembered, however, that if pellagra is a deficiency disease, its relation to corn is precisely the relation of beri-beri to rice. That is, corn *per se* is not harmful, but that when certain kinds of corn are too exclusively consumed, a deficiency of some unknown substance or vitamine necessary to metabolism is created. That when corn made from the whole grain is used, this deficiency does not exist; and that pellagra can undoubtedly originate on a diet which contains no corn, if it consists of other components lacking the pellagra vitamine.

Statements that pellagra has originated among those eating a proper diet are of no more value than the similar statements made so often in the case of beri-beri. We do not yet know enough about the chemical constitution of foods and their relation to metabolism to make any positive statement with regard to the relation of diet to pellagra.

Digitized by Google

3. Pellagra, like beri-beri, has been investigated carefully for a number of years in the endeavor to discover some microorganism or toxin responsible for this condition. All such efforts have been futile.

4. Like rice and wheat, the grain of corn has an external aleurone layer which contains many chemical constituents important as food, and this layer is removed by modern methods of milling. The following two quotations from Wiley[26] emphasize this point: "MAIZE FLOUR (Corn Meal).—Formerly the maize kernel was ground between stones, bolted to remove the bran, and the maize flour or corn meal thus produced used directly as a human food. Modern milling operations have changed the method of producing maize flour so that not only is the outer bran removed but also, to a large extent, the germ itself, thus diminishing the quantity of fat in the prepared meal. This is notably true of the maize flour which is prepared for exportation. Leaving in the flour such a large quantity of fat tends to produce rancidity during shipment. To avoid any change of a deleterious nature which the flour may undergo during shipment, it is also frequently kiln-dried before being sent to foreign shores and even when intended for domestic consumption at points remote from the mill.

While this preparation of maize flour is doubtless important for transportation purposes, it impairs the palatability and nutritive value of the product. It is advisable to have the maize flour prepared in the old-fashioned way and sent directly into consumption."

"The above data show that the refined Indian corn meal has lost more than three-fourths of its fat, a large portion of its mineral matter, and also a very considerable proportion of its protein, due to the separation of the bran which is extremely rich in protein and the germ which is rich both in oil and protein. A mere glance at the data shows that this refined Indian corn meal is much less nutritious than the natural meal in so far as its content of tissue-forming bodies and its faculty to furnish heat and energy are concerned. In other words, the calories are much lower than in the natural corn meal. This is another rea-

Digitized by Google

son for urging our people to return to the consumption of the old-fashioned material."

5. The great increase of pellagra in this country has occurred contemporaneously with the introduction of these modern methods of milling corn, i. e., with the increased consumption of a decorticated corn.

Just as the connection of beri-beri with rice was obscured for many years because the great differences existing between different kinds of rice were ignored, so it is possible that the study of pellagra has been similarly obscured.

It must be remembered that this argument is an analogy, which may or may not be substantiated by subsequent study of pellagra. No positive statements should be made as to the etiology of any disease as a result of reasoning by analogy. But such reasoning is very suggestive, and would certainly seem to justify a thorough investigation of this phase of the subject.

However this may be, knowing these facts, a more varied diet must be insisted upon in our jails and institutions. The following suggestions are offered, because it is believed that if followed, beri-beri and scurvy at least will be prevented.

1. In any institution where bread is the staple article of diet, it should be made from whole wheat flour.

2. When rice is used in any quantity, the brown, undermilled, or so-called hygienic rice should be furnished.

3. Beans, peas, or other legume, known to prevent beri-beri, should be served at least once a week. Canned beans or peas should not be used.

4. Some fresh vegetable or fruit should be issued at least once a week and preferably at least twice a week.

5. Barley, a known preventive of beri-beri, should be used in all soups.

6. If corn meal is the staple of diet it should be yellow meal or water-ground meal, i. e. made from the whole grain.

7. White potatoes and fresh meat, known preventives of beri-beri should be served at least once a week, and preferably once daily.

8. The too exclusive use of canned foods must be carefully avoided.

Digitized by Google

III. Further Comment on the Proposition to Tax Overmilled Rice in View of Recent Criticism of Such Action.

It has been proposed in the Philippines by Dr. Victor G. Heiser, the Director of Health, that in order to prevent beri-beri, overmilled rice from which the external layers have been removed should be heavily taxed. It is believed that if this tax were levied, it would raise the price of this rice to a figure that would be practically prohibitive to the poor natives who are the ones who chiefly suffer from beri-beri. The price of the undermilled rice, which is a safe article of diet would remain unaffected, and this would consequently be purchased, and beri-beri be eliminated.

The writer first proposed in a paper read before the Fifteenth International Congress on Hygiene and Demography[27], that a commission should be appointed to investigate this most important subject and report on the advisability and practicability of such international action. This action was opposed by Dr. Wellman, apparently on the grounds, that since it had been proven that beri-beri could originate from the use of other articles of diet, such as white wheat flour, it was useless to incriminate rice solely.

Wellman and Bass[7] read a paper before the Tenth Annual meeting of the American Society of Tropical Medicine, in which they reached among others, the following conclusions:

5. "These experiments indicate that legislation or regulation against the sale of 'polished' rice, based upon the fact that Polyneuritis gallinarum results from feeding it as an exclusive diet, are not warranted."

6. "The evidence here presented indicates that several other common articles of diet produce polyneuritis gallinarum as certainly as does rice, either 'polished' or 'unpolished.' In three instances these other foods produced the disease in quicker time than did rice."

7. "There is, therefore, more argument against the sale of these common articles of diet, sago, Irish potatoes, and corn starch, than there is against the sale of rice, 'polished' or 'unpolished,' milled or unmilled."

Digitized by Google

This treatment of the subject of legislation appears to me to rest upon three misconceptions:

1. That the glucose and talc used in polishing rice in this country have been supposed to be harmful.

2. That any legislation with regard to rice used in this country is desired.

3. That because it has been shown that beri-beri can be produced by the use of other diets than rice, that any legislation against highly milled rice will be useless.

In reply to these three points, I would state:

1. That, so far as I am aware, no one has even distantly hinted that the glucose and talc used in polishing rice are harmful, or produce neuritis in fowls or beri-beri in man. As a matter of fact, this polishing of rice by a coating of glucose and talc is not customary in the process of milling used in the Orient. On the contrary, it has been emphasized that the highly milled rice is injurious because of the deficiency of certain substances removed from the rice in the process of milling.

2. So far as I am aware, no one, least of all myself, desires any legislation in the United States with regard to any rice consumed in this country. If a large quantity of highly milled rice was exported from this country to regions in which beri-beri is endemic, it might be proper to pass such legislation as would ensure the production of an undermilled rice for those countries. But to suppose that legislation is desired with regard to rice consumed in the United States is an absurdity, of which I have not been guilty.

3. While it has long been recognized that beri-beri can be and has been produced as the result of other diets than highly milled rice, it is also true that in those countries in which beri-beri is endemic to such an extent as to be a sanitary problem, it is almost invariably produced as the result of a too exclusive diet of highly milled rice. Since it is impossible to furnish these races with a properly varied diet because of their poverty and ignorance, it appears that legislation for the purpose of compelling the use of an undermilled rice is not only not foolish, but is the only possible solution of this sanitary problem. In the

Digitized by Google

discussion that followed the reading of the paper of Wellman and Bass, a number of participants stated that legislation in this country was foolish, and the following resolution was unanimously adopted: "Resolved, This society deprecates legislation in this country against milled or polished rice as a food."

The writer has urged[1] the advisability of international legislation tending to substitute the beri-beri preventing undermilled rice for the beri-beri producing highly milled rice. If such international action were taken, it would necessitate legislation in this country, not against the highly milled rice *consumed* in this country, but prohibiting the production of such rice for exportation to countries in which beri-beri is frequent. The wording of the resolution of the society, deprecates any and all legislation in this country. It is hoped that at the next meeting of the society, this question may be again discussed and that the resolution previously passed may be altered to read as follows:

Resolved, This society deprecates legislation in this country against highly milled or polished rice intended for domestic consumption, but advocates legislation tending to prohibit the exportation of this highly milled rice to countries whose inhabitants subsist largely upon rice and in which beri-beri is prevalent, provided that other nations take a similar action.

References.

1. Vedder. Beri-beri. Wm. Wood & Co., 1913.
2. Lukis, P. Beri-beri and the Deficiency Theory. *Jour. Trop. Med. and Hyg.*, London, 1914, XVII, 78.
3. Lovelace. The Etiology of Beri-beri. *Jour. A. M. A.*, 1912, LIX, 2134.
4. Lovelace. Peripheral Neuritis in the Amazon Valley. *Am. Jour. Trop. Dis. and Prev. Med.*, 1913, I, 140.
5. Little, J. M. Beri-beri Caused by Fine White Flour. *Jour. A. M. A.*, 1912, LVIII, 2029.
6. Vedder and Clark. A Fifth Contribution to the Etiology of Beri-beri. *Philippine Jour. Science*, 1912, VII, 423.
7. Wellman and Bass. Polyneuritis Gallinarum Caused by Different Foodstuffs; with Especial Reference to the Effect of Commercial Rice Coating on Neuritis Production. *Am. Jour. Trop. Dis. and Prev. Med.*, 1913, I, 129.
8. Fraser and Stanton. The Etiology of Beri-beri. *Brit. Med. Jour.*, 1913, II, 1091.
9. Arnold, J. J. The Etiology of Beri-beri. *Brit. Med. Jour.*, 1914, I, 299.
10. Morse. Report on Outbreak of Beri-beri Amongst Prisoners of War at St. Helena. *Jour. Roy. Army Med. Corps*, 1904, III, 237.

Digitized by Google

11. Fenton. The Etiology of Beri-beri. *Brit. Med. Jour.*, 1913, I, 1271.

12. Stanley. The Etiology of Beri-beri. *Brit. Med. Jour.*, 1913, II, 1160.

13. Clarke, J. T. The Etiology of Beri-beri. *Brit. Med. Jour.*, 1914, I, 113.

14. Smith and Hastings. Multiple Neuritis Among Soldiers in Calcutta and Vicinity. An Endemic, Epidemic, Seasonal Disease Resembling Beri-beri. *Jour. Roy. Army Med. Corps*, 1913, XX, 202.

15. Priest, R. C. Some Observations Upon Thirty-one Cases of Multiple Peripheral Neuritis Amongst European Troops in India. *Jour. Roy. Army Med. Corps*, 1914, XXII, 173.

16. Fraser and Stanton. An Enquiry Concerning the Etiology of Beri-beri. *Lancet*, 1909, I, 451. Also 1909, II, 406.

17. Strong and Crowell. The Etiology of Beri-beri. *Phil. Jour. Sci.*, 1912, VII, 271.

18. Bondurant. Report of Thirteen Cases of Multiple Neuritis Occurring Among Insane Patients. *Med. News*, 1896, LXIX, 365.

19. Bondurant. Endemic Multiple Neuritis (Beri-beri). *N. Y. Med. Jour.*, 1897, LXIX, 685, 728.

20. Bradfield, J. W. *Tex. State Jour. Med.*, Fort Worth, Texas, 1907, III, 193.

21. Sams. Beri-beri in South Carolina. Pub. Health Rep., 1910, XXV, 437.

22. Butler. Beri-beri. *Jour. South Carolina Med. Assn.*, 1910, X, 234.

23. Jervey. A Report of an Epidemic of Beri-beri Occurring at Convict Stockade, Ten Mile Hill, Charleston County. *Jour. South Carolina Med. Assn.*, 1910, X, 231.

24. Parker. A Report on Beri-beri in the County Jail at Elizabeth, N. J. Pub. Health Rep., 1914, XXIX, 339.

25. Alsberg. Address Before the Biological Division of the Am. Chemical Society. *Science*, 1913, XXXVIII, 764.

26. Wiley. Foods and Their Adulteration. 2nd Ed., 1911, p. 230.

27. Vedder. The Prevention of Beri-beri. Transactions 15th International Congress on Hygiene and Demography.

Digitized by Google

SOME EDUCATIONAL METHODS FOR USE IN ANTI-MALARIAL WORK.*

By

H. R. CARTER.
Senior Surgeon, U. S. Public Health Service.

I judge that for effective malarial work in the United States just now the crying need is for education. It is not research. True enough there are two or three problems in malaria yet to be solved, the determination of which would be of advantage—possibly of great advantage—to the sanitarians. Yet speaking broadly, enough is known now of malaria, of its conveyance and the conditions which determine its spread, to enable us to control it. It is not knowledge of what to do. It is getting the needed work done that is lacking for malarial control. Now if knowledge about malaria were general; if what is known by sanitarians, and doubtless by you before me, were known to the mass of the people, such a public sentiment would be created as would *demand* the doing of work necessary for the control of malaria. What is needed then is to get this knowledge more widely spread, to get it down to the people. To educate them to a knowledge of what malaria is; of what causes it; and how it is contracted, and how it can be prevented. With this knowledge generally spread, known to everyone and believed in by everyone, physicians and people, we will have things in train for the work which will solve the malarial problem. For it is work—field work—that is needed.

Now we know that knowledge of itself will not lead to results. We, in Panama, know no more about malaria than the English did at Mean Mir. Indeed they were our superiors in scientific knowledge, but we got down to actual work and kept at it; hence the difference in results. The object of our education is to lead to work; intelligent, well-directed work, and unless it

*Read before the National Drainage Congress, Savannah, Georgia, April, 1914.

Digitized by Google

does this it is futile. In advocating, then, two methods of education in things malarial, I am in no wise doing so simply to increase the sum of knowledge of this subject. It is that this knowledge may lead to work and the control of this scourge of wet lands, West, South and North, and even on the Pacific Coast.

I will bring to your attention then two methods of education which I believe will lead, will inevitably lead, to efficient anti-malarial work.

FIRST: *Teaching something about malaria as lessons in the schools.* Planting this knowledge in children so that it may be a foundation knowledge in the rising generation to be believed in as instinctively and without question as that the round letter is "O" or that "c-a-t" spells "cat."

SECOND: *The demonstration of anti-malarial work,* of well planned, well executed, economical, and successful anti-malarial work in a community, as a lesson of another kind, an object lesson to, not children this time, but to men, convinceable only by demonstration. This would show not only what to do but how to do it and what it costs, and would demonstrate whether or not such work was feasible and advisable elsewhere.

You see that these two methods are the two extremes, so to speak, of an educational system; the one for children, the other for men; the one mainly didactic, the other a demonstration, but both purely educational.

Of the first I will say that it is not new and why it has not been more generally used where needed, that is in malarial sections, I do not know. So far as I know this method was first applied in the schools in San Antonio, Texas, in 1904, and I presume the latter part of 1903, and to yellow fever and not to malaria. There was, as you know, an epidemic of yellow fever in the part of Texas near the Mexican border in 1903, and the next spring at any rate the conveyance of yellow fever; the biology of *Stegomyia fasciata,* as *Aedes calopus* was then called, were burning questions in the schools of San Antonio, and were studied with eagerness, interest, and I believe large profit by the pupils. I was in Texas in April and May of that year, but a

Digitized by Google

much better account than I can give has been written by Dr. Howard. I cannot do better than to quote him in extenso.

"Teachers became deeply interested in the subject. A crude aquarium, with eggs and wrigglers, was kept in every schoolroom, where the pupils could watch them develop; and large magnifying glasses were furnished in order that they might study to better advantage. Lessons were given and compositions were written on the subject. Competitive examinations were held, and groups of boys and girls were sent out with the teachers on searching expeditions to find the breeding places. Rivalry sprung up between the 10,000 public school children of the city in the matter of finding and reporting to the Health Office the greatest number of breeding places found and breeding places destroyed. In addition to these measures, a course of stereopticon lectures was arranged, grouping the pupils in audiences of about 1,000 from the high school down, and, in Dr. Lankford's words, 'It was an inspiring sight to watch these audiences of a thousand children, thoughtful, still as death, and staring with wide-open eyes at the wonders revealed by the microscope. It seemed to me that in bringing this great question of preventive medicine before the public school children we had hit upon a power for good that could scarcely be over-estimated.'"

The result of this work was a decided diminution in the number of mosquitoes in San Antonio. One result of this work was that while there has previously been from fifty to sixty deaths a year from malarial trouble, the mortality was reduced 75% the first year after this work was begun, and in the second year *it was entirely eliminated from the mortality records of San Antonio.*"

Some work too, I think not much, has been done in a few schools of California. In the Primer on Sanitation by Ritchie used in the schools of North Carolina there is a chapter on malaria which is very satisfactory and doubtless more or less about malaria is taught in our schools along with other hygiene and sanitation.

I do not claim, then, to bring to you anything new, but I do plead for the development of this method. I suppose that Dr. Lankford of the San Antonio schools was in advance of his time, for this method, ten years after his very brilliant use of it, is very little used. In my opinion for *ultimate results*—when the children grow up—it will give a larger value per unit of expenditure than any other educational measure I know of for malaria; that is, if earnestly and intelligently used. Children

Digitized by Google

are by nature fond of natural history and if the teaching includes some field work, demonstration of larvae in their breeding places, etc., as well as the raising of them in fruit jars, etc., in school, there will be no lack of interest.

I do not pretend that we will get the San Antonio results in the average school in which these methods may be used. It would be unreasonable to expect it. San Antonio was a large town with advanced classes and considerable money, while to do the most good and reach the pupils who most need this knowledge this teaching must be in the country schools, for malaria is essentially rural and not a civic disease. In the towns, or in some towns, results should be obtained comparable to those described, and this would do much immediate good. In the country where malarial conditions are most prevalent the correction of these conditions would be far more difficult and would go on more slowly, but the education of the mass of the population—the whole population—to know what malaria is, how important it is, how it is conveyed and how it could be prevented, would be a most efficient factor in its control, or even ultimately in its elimination. I said "when the children grow up." I look upon this conflict with malaria in the United States as no short one, and I believe that there will be an abundance to be done as adults by the children now in school, in the fight for the control of malaria.

Teaching the facts then about malaria in the public schools, if done generally in malarial sections, should lead to a considerable amount of immediate good and ultimately go far toward the control of malaria.

Quite recently Miss Neeley, Secretary for the Virginia Society for the Prevention of Malaria, allowed me to examine a course of lessons she had arranged for schools and which were being taught in at least one private school in Norfolk. These lessons are good and in simple language and contain the fundamentals. I also have arranged a short course of lessons on this subject for the use of schools. They are arranged as questions and answers as most suitable for schools, like a catechism in fact. If found suitable they may be published by the Public Health Service, and I hope I may be of service to some of you who will

Digitized by Google

undertake to work along the lines I have indicated, at least as a basis for someone, more skilled in pedagogy than myself and with more time at their disposal, to write something better.

Let us take up now the second educational method of which I spoke—*the demonstration of anti-malarial measures in a community.* Note that I speak of it only as an educational measure. Properly carried out it will benefit the community trying it, but this is incidental, its main value will be to demonstrate anti-malarial measures to other communities.

The plan I have in view is to select some community in which malaria is prevalent and have made:

1. A survey of the prevalence of malaria.
2. A survey of the conditions producing malaria; that is the prevalence of malaria-carrying mosquitoes; breeding places, brush, etc.
3. A careful planning of the measures required to control malaria in that community.
4. A detailed estimate of the cost of these measures.
5. A determination of what measures should be adopted within the limits of allowable cost—this by comparison of 3 and 4.

Having determined on the work to be done *to do it,* under a skilled engineer, economically and effectually.

Obviously a community should be selected typical of such other communities as would be apt to profit by this example; which would take similar measures to control their own malaria. If the work be successful and gives a good profit on the money spent, a certain number of communities will do this. As there are various types of places in which malaria prevails, demonstrations should be made in more than one place so as to include those typical of all that would probably profit by the object lesson. To take a concrete example I suggested for North Carolina a couple of towns in the tidewater and a couple above tidewater, as the difference of conditions for anti-malarial work between these two divisions of the State are very marked.

The community selected for the purpose of demonstration for any type must be carefully chosen. The more prevalent malaria is the better, provided it can be controlled at a cost which would not be prohibitive to those wishing to copy the work.

Digitized by Google

How about the cost of this work? It is as important to the sanitarian to know where he will get money to pay for work needed, as it is to know what work is needed, and generally the problem is harder. I think that, except the expert work, in most cases the cost should be borne by the community to be benefited. By expert work I mean the malarial surveys; the planning of the anti-malarial measures and the supervision of the work itself. This class of work, few communities of the kind in which these demonstrations would be most useful, are able to provide. There are very few sanitary engineers in America who have had experience in anti-malarial work. And here let me say that unless I am mistaken arrangements are under way for the transfer to the United States Public Health Service of the Chief Sanitary Inspector of the Canal Zone, the man who has been in direct charge of the anti-malarial work there, who has had a very large and successful experience there.

The plan that I outlined to Dr. Rankin last summer was that some community be selected suitable for demonstration; a preliminary survey (enough to make a reasonable estimate of cost) be made without expense to them; that the matter be then presented to them and, if they agree to bear the expense, that the work be undertaken under the supervision of a sanitary engineer. It looks reasonable that a community should bear this expense for its own benefit, especially as it is not to bear the whole of the expense. They will appreciate what they pay for far more than what is given them. Yet for some places I would greatly like to be able to pay part of the expense. Let me quote a recent answer to a question before a Senate Committee.

"I am in favor of the Government planning the work, supervising the work, and letting the other people pay for it, and only for a few places, and that for demonstration."

I mean for the United States to select communities with typical malarial conditions; to determine what work was advisable for each community; to plan for such work in detail and to supervise the work done. Thus useless work would not be undertaken and that undertaken would be done economically and efficiently. The cost of supervision, i. e. the salary of the sanitary engineer, for it would require a trained man, would be

Digitized by Google

borne by the United States. That of the work itself by the community.

Sometimes it would be advisable for the United States to bear a certain portion of the cost of the work itself. This in the case of a very malarious community furnishing the most suitable demonstration for an object lesson. Such communities on account of being highly malarious, are usually very poor. Understand, this work is not purposed primarily to benefit the community doing it, but as an object lesson to show other communities what to do, how to do it, and what good it does; as an educational measure for all communities under similar conditions. Incidentally, it *will* benefit the community doing it, and that is the reason why it should be willing to pay for the work, or at least some portion of it."

I have not answered my own question: "Who will bear the cost of this work?" I have implied that communities most suitable for demonstration cannot well furnish the expert work needed. The State ought to be able to, the United States is able to. Whether the latter will help to that extent I do not know. I have no authority to say that it will; but, personally, I hope so.

Digitized by Google

MALARIAL INVESTIGATIONS IN THE UNITED STATES BY THE U. S. PUBLIC HEALTH SERVICE.*

By
R. H. VON EZDORF,
Surgeon, U. S. Public Health Service.

Only a brief account of the present and contemplated activities of the United States Public Health Service in relation to malaria investigations in the United States thus far adopted and planned, will be discussed.

Orders were first issued by Surgeon-General Blue, dated February 28, 1912, directing me to make a study of the prevalence of malarial fevers in the State of Alabama, and after the passage of an act of Congress June 24, 1913, providing for an appropriation of $100,000 for field investigations, orders were issued July 8, 1913, to extend the studies to other States, which included Arkansas, Florida, Georgia, Mississippi and South Carolina. The States of North Carolina and Tennessee were included later. Similar work was conducted for the State of Louisiana, under the direction of Surgeon J. H. White.

It is expected to include the States of Oklahoma and Texas, during the present year.

A visit was made to the offices of the Boards of Health of all the States in which the studies were undertaken, and arrangements made to obtain from these offices all available statistics, chiefly mortality reports, and their co-operation and assistance obtained in the collection of material and morbidity statistics for making an epidemiological study of the disease in their respective States.

Statistical.

For the purpose of gathering statistics and information bearing mainly on the morbidity of the disease and other data relating to malaria, such as laboratory reports, species of mos-

*Read before the National Drainage Congress, Savannah, Georgia, April, 1914.

Digitized by Google

quitoes, breeding places of mosquitoes, etc., franked circular postal cards are mailed to all physicians in the States, requesting them to answer certain questions on the attached reply cards, which are franked and require no postage.

There are about 12,000 such postal cards mailed each month, and beginning with July, 1914, it is expected to mail 25,327 postal cards monthly.

The replies are filed by counties and then tabulated each month in order that the seasonal prevalence may, so far as is possible, be studied.

Publications.

Reports have been made regarding the investigations and geographic distribution of malarial fevers in the States of Arkansas, Alabama, Georgia, Florida, South Carolina and Mississippi, and the subject, so far as is possible, considered under the following heads:

Geographic Distribution.

Mortality and Morbidity Statistics.

Seasonal Prevalence.

Types of Infection.

Malarial Index, by Blood Examinations.

Surveys, Including the Breeding Places and Determination of Species of Anophelines Present.

Statistics of Chronic Malaria, Number of Children Under 15 Years of Age Affected; Prophylactic Measures Employed.

Several articles have been written by officers of the service which are intended for popular distribution. These appear as reprints from the Public Health Reports. A catechism on malaria, mosquitoes, and prevention of malaria is also in preparation.

Reprints of the reports made on the prevalence of malaria in the several States named, will also be available. Reports on the States of North Carolina and Tennessee, for 1913, are now in preparation.

Digitized by Google

Educational.

Under the auspices of the State Boards of Health, arrangements were made for delivering public addresses and lectures in the schools, on the subject of malaria, the method of spread of the disease and its prevention. The local conditions are investigated and invariably discussed.

There have been prepared a number of lantern slides showing the breeding places of mosquitoes in rural districts, towns and cities, others showing the life cycle of mosquitoes and the different kinds of mosquitoes, blood cells infected with malarial parasites and the different stages of development of the parasites; temperature charts of active cases of the disease; the life cycle of the parasite in man and in the mosquito; effects of chronic malaria in the child; slides with legends regarding quinine prophylaxis; methods of screening and drainage, have been collected. These slides with a lantern slide projection apparatus, form a part of the field equipment to be used in lecturing on the subject.

Photographs are being made and collected which will be reproduced in lantern slides to broaden and enlarge the present collection.

It is expected to have a moving picture film produced on the ubject of malaria and mosquitoes for which a scenario has already been drawn.

In addition, specimens of larvae and pupae are collected in the localities where surveys are being made. These are exhibited to show the different species and demonstrations are given to show how anopheles may be identified. Whenever it is possible, a class of school children of the higher grade, are taken out on a search for mosquito breeding places, and taught to distinguish the anopheles larvae. Specimens of larvae and pupae are collected, placed in jars or other suitable containers, and the pupils advised to observe and follow the development of these into full grown mosquitoes, so that the differences of appearance of the male and female mosquitoes, as well as the differences of the genera in the adult form, may be learned. The chief characteris-

Digitized by Google

tics of the different genera of mosquitoes, are set forth in a lecture and specimens used for demonstration.

Surveys—Malarial Index.

Surveys are made in selected localities. . These surveys include a study of the geographic and climatic conditions of the localities; social, hygienic and economic conditions of the community; industries; breeding places of anopheles; the prophylactic measures best adapted, and then authorities advised regarding them.

It is expected to have a sanitary engineer connected with this work who will prepare plans and estimates as to cost, where communities desire to undertake eradicative measures.

The malarial index is made by the collection of blood specimens of all persons who will submit themselves for this examination. A report giving the names, with ages, sex, color and type of infection of those persons found to be harboring or carrying the parasite, is submitted to the health authorities upon the completion of the microscopical examination, in order that a personal, as well as a public benefit may be derived thereby.

During the past year, 1913, specimens were obtained in North Carolina from 3613 persons, among whom 309, or 8.55%, practically 1 out of every 12 persons, were found to be carrying the malarial parasite. In Arkansas, specimens were obtained from 802 persons, in whom 53, or about 1 in 16, showed parasite infection. In Alabama, of 664 examined, 25, or about 1 in 26, showed parasites in the blood.

With a view to making surveys in selected localities in each of the Southern States, a letter was addressed to State health officers, requesting them to name the most favorable places in their respective States for doing such work.

In the State of North Carolina, Dr. W. S. Rankin, the State health officer, requested a conference to draw up a plan for an anti-malarial campaign during the coming season in the eastern part of this State. The following is an outline of the plan agreed upon:

Digitized by Google

On the part of the State Board of Health, under the direction of Dr. W. S. Rankin, will be taken up:

1. Malarial Day, to be promulgated by the Governor of the State.
2. Request Congressmen and State officers to give addresses, on the same day, at principal points in the State, during June or July.
3. Publish regular State Board of Health Bulletins, to be known as the "Malarial Special."
4. Prepare special newspaper articles on malaria, for publication.
5. Have members of the State Board of Health, county and local health officers, and others, give addresses on malaria in eastern counties where organized county forces may have speakers.

On the part of the United States Public Health Service:

1. Lectures on malaria, with lantern slides and moving picture films, during July, August and September.
2. Make sanitary surveys in several counties to determine malarial parasite index, clinical index, breeding places and determination of species of anopheles mosquitoes; make estimates of the cost of anti-malarial measures in communities desiring to undertake work.
3. Draw up outline for addresses, setting forth facts about malaria, to be used by state speakers.
4. Public reprints on screening and malaria prevention, for distribution.

It may here be stated that much interest was aroused by the surveys and the malarial index work done during the past year, and such work will, no doubt, prompt other States to undertake an active and broad campaign.

This plan may serve as a tentative standard for other States to follow.

Demonstrations.

The importance of making a demonstration in each State to show that the disease is preventable and can be controlled by applying the accepted measures for prevention, is generally conceded by those engaged in health work.

At Roanoke Rapids, North Carolina, Dr. T. W. M. Long, a physician in the employ of several cotton mills located there, secured funds amounting to $3500 for anti-malaria work at that place, during the coming year. Dr. Long stated that this has been made possible as a result of a visit made by Senior Surgeon H. R. Carter and myself, and also as a result of the surveys including the index work. The plan adopted will be mainly

Digitized by Google

that of securing good drainage of places which were found responsible for breeding anopheles mosquitoes.

This demonstration, if properly supervised, will undoubtedly have a far-reaching influence in stimulating other communities to do similar work.

Research.

A biologist has been detailed to the force of workers.

It is planned to carry out a number of experiments and observations relating to the life of Anophelines, transmission of malaria, and a study of the infected hibernating anophelines and the infectivity of the different species of anophelines, etc., is contemplated.

Personnel.

An office and laboratory have been established at Mobile, Alabama, where this work is being conducted. The personnel comprises four medical officers, one biologist and two stenographers and clerks, who are also serving as statisticians. It is expected to increase this force with one sanitary engineer.

Similar work also has been conducted in the State of Louisiana, at New Orleans, under the direction of Surgeon J. H. White, with two medical officers to assist him.

In addition Senior Surgeon Carter has been engaged in making surveys in North Carolina, and has prepared valuable articles on the subjects of screening, quinine prophylaxis for malaria and anti-malaria measures for farm houses and plantations, and is devoting much of his time to this subject.

Digitized by Google

SOME THOUGHTS UPON THE PREVENTION OF MALARIA AND ITS RELATION TO THE DRAINAGE OF SWAMPS AND OTHER COLLECTIONS OF WATER.*

By
ISAAC W. BREWER, M. D.,
Taughannock Falls, New York.

To be successful in any line of work a man must be able to see the questions that come before him from the other man's viewpoint as well as from his own. This I think many of the health authorities and the lawmakers fail to appreciate. Not infrequently the prevention of disease appeals to them so strongly that measures are adopted which are not only inadequate but are also expensive and do harm in other ways. I think some of the agitation looking towards the eradication of the mosquito may be classed in such a category.

Before the court of public opinion the mosquito has been indicted on two counts:

Firstly: Mosquitoes are a nuisance.

Secondly: Mosquitoes transmit disease from one human being to another.

These charges have been tried in the court of scientific investigation and the mosquito stands convicted on both counts.

The same court has passed the death sentence upon the mosquito, and the execution of this sentence rests in the hands of each community where mosquitoes are found.

Before it was known that mosquitoes transmitted malaria and yellow fever very little was done to abate the nuisance caused by them. True it is, that large areas once infested by mosquitoes have been reclaimed, but this reclamation was only incidental to other public work. However, since 1899 much has been done to rid communities of the mosquitoes. Probably the most important work of this kind in the United States has been

*Read before the National Drainage Congress, Savannah, Georgia, April, 1914.

Digitized by Google

the reclamation of the flats between Jersey City, N. J., and Newark. The work done by Colonel Gorgas in the Canal Zone is a monument of the American people as well as to the distinguished sanitarian himself. He, however, had at his command what few communities can boast of, sufficient funds to accomplish the desired result.

There are many communities where mosquitoes abound in which nothing is being done to restrict them in any way. This apathy is accounted for as follows:

1. Lack of a leader.
2. Lack of sufficient funds to finance the undertaking.
3. Lack of public spirit.
4. Willingness on the part of the inhabitants to let things take their own course.

I take it that the Malarial Eradication Section of the National Drainage Congress desires to overcome these obstacles and to assist communities to rid themselves of mosquitoes.

All work tending to eradicate malaria must aim at the breeding places of the mosquito. In these places the larvae must be killed or the place itself made uninviting for the female mosquito to deposit her eggs in.

To accomplish this we must either drain the collections of water in which the eggs are deposited or oil them so that the larvae will die before reaching maturity. If the breeding place be a swamp or river with swampy banks it is generally recommended to drain them.

Before entering into this work a careful study of the mosquitoes found in the locality must be made, and the places where they breed sought out. Before any draining is done we must consider well what will be the net result of the work. Swamps have a place in the economy of the commonwealth. They are vast storehouses for moisture which slowly entering rivers and creeks keep from going dry during the period of diminished rainfall.

I am firmly convinced that many of the ills from which our country suffers come from a thoughtless interruption of the

Digitized by Google

plans of nature. While there is no evidence that the amount of precipitation reaching the earth has changed during historic times, there is abundant evidence to show that the results of heavy precipitation is very different to what it was formerly.

It is perfectly clear to me that if the melting snow had to percolate through an extensive area of swamp the spring freshets which so commonly cause great damage would be of far less serious nature.

In our efforts to destroy the breeding places of the mosquito we must recognize the importance of retaining the moisture in the soil rather than having it run off immediately it falls from the sky. I think it would be much better to dredge out the swamps and turn them into lakes, which would not only be a playground for the inhabitants, but if stocked with fish, that will eat mosquito larvae, will abolish the mosquito as effectually as if they were drained. In addition the supply of animal food would be increased.

I am very certain that very little can be accomplished by draining the delta of the Mississippi river, and feel equally certain that if much of the swampy land in that locality were converted into lakes we would not have so many floods as at present.

At present there appear to be certain localities where the mosquito is so strongly intrenched that it will be impossible to eradicate the pest at a cost within the resources of the community. In such places we must protect the citizen from the mosquito. Six years residence in the tropics has demonstrated to me that this can be most effectually done by the use of mosquito nets. The only drawback to them is that they cut off some little air.

In regions where rice is grown it seems to be impossible to get rid of mosquitoes, but the problem is well worth the consideration of those who are living in such regions and is probably not beyond the possibilities of the future.

Digitized by Google

THE ADMINISTRATION OF EMETINE TO YOUNG AND DEBILITATED CHILDREN.

By
NATHAN BARLOW, M. D.,
Cuyamel, Honduras.

Case I.

A white child, 16 months old, was treated for estivo-autumnal malaria. After six weeks the parasites were absent from the peripheral circulation, and the periodical fever has disappeared. The child remained greatly debilitated; hemoglobin 40%, eosinophiles 12%. Examination of feces revealed large numbers of *Loschia histolytica,* and the mother admitted having noticed blood in the movements. The child weighed 21 pounds. One grain of emetine is considered by all observers a safe daily dose for an adult weighing 150 pounds. According to Young's rule, or estimated by proportional body weight, the dose for this child would be one-seventh of the adult dose. Owing to the injection in children being an unpleasant procedure, a daily dose of one-seventh grain was given in a single injection for two weeks. Immediate improvement was noticed and one month later the child was gaining weight, and apparently perfectly healthy. Prophylactic quinine treatment is being continued. No ill effects of any kind were noticed.

Case II.

A native child, age 7, with a combined infection with *L. histolytica* and *Necator americanus*. Weight 30 pounds, hemoglobin 5% only, pulse very irregular and weak, heart dilated, edema marked. The patient was deemed unable to survive an effective dose of any of the remedies for hookworm. By proportionate weight and by Young's rule, one-fifth of a grain and one-third of a grain should be safe doses. One-fifth of a grain

Digitized by Google

was given two days, and then one-third of a grain, without ill effect. Iron was prescribed, with nourishing diet and complete rest. The patient is improving rapidly, and it is hoped that in a few weeks he will be able to undergo treatment by thymol.

The question of the permanency of the cure is the same as in adults, and is now being discussed by many observers. In Case 1, on the fourth day, and in a few of the adult cases which have been treated in this hospital, on the fourth and fifth day, there occurred, two or three hours after the injection, a sharp rise in temperature, accompanied by one or two bowel movements with tenesmus. These symptoms subsided in a few hours, and were not repeated. In view of recent observations on the gradual death of the entamœbæ under emetin,* it seems possible that the fourth or fifth injection of a single daily dose may have suddenly killed a number of degenerated amœbæ, and produced something analogous to the Herxheimer reaction. It would be interesting to know if other observers have noticed a similar reaction in any of their cases.

*W. M. James, *American Journal of Tropical Disease*, December, 1913.

RHEUMATIC MALARIAL FEVER.

By
NATHAN BARLOW, M. D.,
Cuyamel, Honduras.

The writer has recently had a series of eight cases which suggest the existence of a rheumatic form of malarial fever. The first case was at a distance from the hospital, and the first blood specimen taken was lost, resulting in a three weeks treatment will alkalis and salicylates. The patient grew steadily worse. When a second slide showed crescents, the treatment was discontinued and quinine administered. He returned to work in ten days.

The second patient came with a typical herpes zoster in the region of the first lumbar nerve. Two days later the picture was that of acute articular rheumatism. After one day of sali-

Digitized by Google

cylate medication he developed a violent active delirium, and in spite of quinine in large doses, he died three days later.

The third, after two days of salicylate, developed aphasia and inability to swallow. Quinine was given intravenously, with recovery. In the five cases following, an immediate searching examination of the blood revealed the parasite, and they made prompt recoveries upon quinine, only one case being prolonged more than two weeks.

The condition may first appear as a neuralgia, as herpes zoster, or as a severe lumbar or sacral pain; or it may from the start be a multiple arthritis. The joints are involved in rapid succession, and there is the same tendency to jump from one to another that is seen in articular rheumatism. The affected joints are not hot or red, and are much less swollen than in rheumatism. The exquisite pain of severe cases of rheumatism is never seen. The swelling is partly within and partly without the joint, is entirely serous in character, and leaves no perceptible changes on subsiding. A simultaneous carditis or pericarditis may occur, completing the picture of rheumatism. Each occurred once in this series, but upon recovery the heart and pericardium were clinically normal in each case.

Fever may be very slight or absent. It is rarely as high as in rheumatism and there is usually not more than one rise in any one day. The profuse sweating of rheumatism does not occur. As to whether there are subvarieties of the estivo-autumnal parasite, the writer is not able to say, but it is certain that this condition indicates a severe form of the fever, and is very likely to be followed by some one of the so-called malignant complications.

Treatment.—Complete rest in bed and attention to the bowels, together with a light diet, are of course indispensable. Quinine must be pushed to the limit of toleration, combined with moderate doses of bromide. The synovial surfaces seem to be difficult to reach with small doses of quinine, and it is better to give the daily amount in one dose. By far the best method is the intravenous injection of 15 to 25 grains each of quinine bichloride and sodium bromide in a liter of freshly distilled water. In view of the frequency of serious complications in these cases, it would

Digitized by Google

be best to treat every case in this manner for one or two days. Salicylates and alkalies in large doses aggravate the pain, prolong the course, and make the condition more resistant to quinine. A single dose of 5 to 8 grains of aspirin may be given daily to relieve pain; much more will increase the pain.

If serious complications do not occur before two days of quinine therapy, the prognosis is entirely favorable for complete restoration to normal.

It is interesting to note that many text-books advise the use of quinine in cases of rheumatism which resist the salicylates; that the books state that "some cases" of herpes zoster are promptly relieved by large doses of quinine combined with various other remedies; and that many practitioners of large experience in malarial regions contend that the best treatment for rheumatism is with calomel and quinine.

There is no doubt but that genuine articular rheumatism occurs in the Tropics with greater frequency than the form described above. We have had 12 cases of indubitable rheumatic fever during this same period, which followed the usual course and yielded in the usual way. And of course rheumatic fever might occur in a patient already infected with malaria. It would seem safer to regard any patient with the clinical differences described above, and who has malarial parasites in his blood, with the proportion of polynuclear cells decreased instead of increased, as suffering from rheumatic malaria, and to withhold salicylates and administer quinine. In this hospital a more rigid rule will be followed, on account of unpleasant experiences in the past. Any patient with apparent rheumatism will be subjected to immediate, thorough search for malaria. If found, he will be put to bed, given an immediate intravenous injection of quinine and bromide, and considered as a case of malaria for several days.

The number of cases of malaria treated by this department during the period was 334. This would correspond to 950 cases in the population from which the cases were drawn, showing that less than 1% of cases of malaria take the rheumatic form.

Digitized by Google

ULCUS INTERDIGITALIS FŒTIDUM.

By
NATHAN BARLOW, M. D.,
Cuyamel, Honduras.

We have had in this hospital three cases of a form of ulcus interdigitalis which may prove very serious on account of the prolonged disability which it produces. It is evidently a specific infection, but as the secretion abounds in every conceivable form of micro-organism, the isolation of the specific form could only be determined by animal experimentation. One of the cases was a secondary infection to mazamorra or hookworm; the second, to a slight wound, and the third originated independently. The patient first notices pain in an already existing fissure, which gradually enlarges to an irregular ulcer, is very likely to invade the other interdigital clefts of the same foot, and often infects the other foot. The fundus is a bright, angry red, the surrounding skin white and sodden in appearance. There is a profuse discharge of bacteria-laden serum, containing very few leucocytes and with an extremely offensive odor. There is no bleeding. The ulcers are exceedingly painful and the patient may be worn by loss of sleep. A peculiarity of the disease is the great swelling of the foot, the foot and ankle, or even the entire calf, which may occur after walking. In one of our cases it was believed that a severe infection of the foot was present. The patient was put upon the table to be prepared for opening the foot, and only a previous acquaintance with the condition prevented incision.

Diagnosis.—An extremely painful, irregular fissure or ulcer between or around the bases of the toes, with the surrounding skin white and sodden, and a profuse, very offensive discharge of a serous or sero-purulent character, is sufficient to distinguish the condition.

Prognosis.—Under the treatment described below, complete healing will take place in from ten days to five weeks, according

Digitized by Google

to the extent of the involvement. Our first case, a very intelligent white civil engineer, was treated for two months, first along the lines indicated by Castellani and Chalmers for the interdigital ulcer of Ceylon, then with every conceivable antiseptic application, including potassium permanganate, salicylic ointment, chrysarobin, and many others. They had either no effect, or aggravated the pain. Two patients have informed the writer that they had suffered from the same condition, which they described correctly, and showed the scars. One stated that he was completely disabled for six months; the other for four. It would seem that there are no complications, but that under ordinary treatment it may disable the patient for a long period.

Treatment.—If very painful, anesthetize with 5% cocaine. Then apply a pledget of cotton saturated with 3% salicylic acid in alcohol, leave in place 5 minutes, and replace with dry cotton, which should be changed as often as possible to keep it absolutely dry. This treatment should be repeated twice daily until the ulcer has completely healed. The patient should not walk at all until he can do so without pain, which is usually in three or four days, and then only limited walking can be permitted and the entire front of the shoes should be cut away.

Digitized by Google

THE AMERICAN SOCIETY OF TROPICAL MEDICINE, ELEVENTH ANNUAL MEETING, BOSTON, MAY 29-30, 1914.

Under the Presidency of
DR. RICHARD P. STRONG,
of Boston.

SECRETARY'S REPORT.

JOHN M. SWAN, M. D.,
Rochester, N. Y.

The COUNCIL met on the evening of Thursday, May 28, 1914. The following members were present: Dr. Richard P. Strong, Dr. Joseph H. White, Dr. C. C. Bass and Dr. John M. Swan. Dr. Joseph D. Weis and Dr. Isadore Dyer were present upon invitation.

The following candidates were recommended for active membership:

Dr. Eugene R. Whitmore, of the Medical Corps, United States Army.

Dr. Brayton H. Ransom, of the Bureau of Animal Industry, Washington.

Dr. Karl F. Meyer, of Berkeley, California.

Dr. Carroll Fox, of the United States Public Health Service, Washington.

Dr. W. C. Rucker, of the United States Public Health Service, Washington.

The following members were recommended to the Society for election as officers for the coming year:

President, Dr. Charles F. Craig, Ft. Leavenworth, Kan.

First Vice-President, Dr. M. J. Rosenau, Boston, Mass.

Second Vice-President, Dr. Bailey K. Ashford, San Juan.

Secretary, Dr. John M. Swan, Rochester, N. Y.

Assistant Secretary, Dr. Allen J. Smith, Philadelphia.

Treasurer, Dr. Joseph D. Weis, New Orleans, La.

Digitized by Google

Councillors to serve two years:

Dr. S. T. Darling, Ancon, Canal Zone.

Dr. Henry T. Nichols, War Department, Washington, D. C.

Dr. Victor G. Heiser, Manila, P. I.

Delegate to the Executive Committee of the Congress of American Physicians and Surgeons:

Dr. W. C. Gorgas, Washington, D. C.

Alternate:

Dr. Joseph T. Siler, New York City.

The Managing Editors of the *American Journal of Tropical Diseases and Preventive Medicine* made the following statement concerning the *Journal*: Eleven numbers have been issued, from July, 1913, to May, 1914, inclusive. The *Journal* has 357 subscribers: 172 members of the Society; 185 subscribers outside of the Society. Of the latter 136 are from the United States, two from the Hawaiian Islands, one from Puerto Rico, four from the Philippines, three from Cuba, seven from Central America, one from Mexico, two from the West Indies, six from South America, two from England, one from Germany, one from Belgium, one from Australia, one from India, five from Africa, ten from China, one from the Malay Peninsula and one from Java. Forty-five copies are sent to advertisers and exchanges, making a total of 402 copies in each issue.

The amendment to the charter proposed at the last annual meeting was discussed. It was finally decided to let the matter lay over until the 1915 meeting and in the meantime the Secretary was instructed to enter into correspondence with the members of the COUNCIL concerning it and other changes in the by-laws.

The question of holding the meeting of the Society in San Francisco in 1915 and the advisability of holding a Congress of Tropical Medicine at the same time was discussed. The question was left in the hands of the existing committee composed of Dr. George Dock, Dr. William H. Welch, and Dr. Isadore Dyer, who, with the Secretary, were given power to act.

The dues for 1915 were fixed at four dollars.

MEMBERSHIP—On April 30, 1913, the membership of the Society consisted of 121 active members, 18 corresponding mem-

Digitized by Google

bers and 37 honorary members. At the meeting of the *Council* held May 5, 1913, eight members were dropped for non-payment of dues. During the year one active member, Dr. Egbert Le Fevre, of New York, died, and three active members, Dr. Chilton Thorington, of Montgomery, Ala.; Dr. W. H. Bell, of Washington, and Dr. J. C. Wilson, of Philadelphia, have resigned. At the last annual meeting, four active members were elected, so that on May 20, 1914, the membership of the Society consists of 113 active members, 18 corresponding members and 37 honorary members.

Notes of the Meeting.

The sessions were held at the Harvard Medical School, where all courtesies and facilities were extended. There were two daily sessions on Friday and Saturday, May 29 and 30, with an interesting program, which was completed. The papers read were of varied types and full of advanced ideas; the discussions were particularly profitable. In addition to the papers announced, additional lectures and papers were presented by various members of the Harvard faculty.

While the general attendance at its meetings was not large, it was representative. The visiting members were liberally entertained by the president, local members and citizens and the courtesies of the Harvard Club were tendered during the meetings.

The various papers of the meeting will be published by the *Journal*, beginning with the July issue.

Digitized by Google

NEWS AND COMMENT

Dr. Herman Canfield, formerly chief sanitary officer of Ancon, Canal Zone, died on April 9, at Saint George, Florida.

Senior Surgeon Joseph H. White, U. S. P. H. S., arrived in Panama, May 1, to begin the study of hookworm in Central America.

The fourth case of pellagra during the year has recently been reported in Kansas. The patient, formerly of Winthrop, has lived in Atchison for about a year.

The Quarantine Station at New Orleans, in charge of Dr. G. M. Corput, Surgeon, U. S. P. H. S., has been taxed to its limit recently on account of the Mexican refugees. The women occupied the frame buildings, and tents were erected for the men.

We are notified of the removal of Dr. Samuel G. Dixon from Ardmore, Pa., to Bryn Mawr, Pa., and of Dr. Guthrie McConnell from Temple University Medical School, Philadelphia, to 347 Llaudrillo Road, Cynwyd, Pennsylvania.

The New York Department of Health desires the adoption of a food standard. Though New York has standardized butter, milk, wine, honey, cider, vinegar, maple sugar and evaporated apples, no other standards are in force.

The first meeting of the Chicago Housing Association was held on May 21. The Association is composed of the housing committees of the different clubs, who by thus joining in one organization, hope to concentrate, strengthen and systematize the work undertaken.

Digitized by Google

Dr. Alfred Conor, assistant director of the Institut Pasteur de Tunis, died recently from a slight injury received while experimenting on a guinea pig. The Cross of the Legion of Honor was conferred on Dr. Conor on his deathbed.

The Board of Administrators of the Medical School of the University of Minnesota has adopted plans for the establishment of a school of public health, for the supervision of health regulations and measures in the university community.

The Public Health Service, through Secretary of the Treasury McAdoo, has asked Congress to appropriate $100,000 to be used to prevent the entrance of contagious diseases into the United States, especially from Mexico. The regular fund for the purpose is exhausted.

Major Allie W. Williams, M. C., U. S. C., is in charge of the first military hospital in Vera Cruz, opened May 1. Surgeon R. H. von Ezdorf, U. S. P. H. S., and Assistant Surgeons J. T. Vaughn and R. M. Kittle, M. R. C., U. S. N., have reported for duty in Vera Cruz.

An erroneous idea has been gotten by some, especially on account of newspaper reports, that restrictions have been placed on travel to and from Cuban ports, owing to the plague there. No such restrictions are in force and the usual quarantine laws prevail.

A campaign against mosquitoes is to be carried on in Atlantic City, for which $26,000 is available. Though the swamps of Cape May County practically proclude the possibility of entirely ridding Atlantic City of mosquitoes, conditions should certainly be much improved.

Harvard University is now issuing booklets called "Health Talks." The first was "The Care and Feeding of Children," by Dr. John Lovett Morse, of Boston; and the second, "Preserva-

Digitized by Google

tives for Food, Their Use and Abuse," by Otto Folin. Other booklets will appear from time to time.

A quarantine camp has been established in Galveston, where refugees from Mexico will be detained six days after arrival. Governor Colquitt of Texas has suggested that it would be more advisable, however, to land refugees at New Orleans, where there is a Federal detention hospital.

The people of Chestnut Level and Keeling, Pittsylvania County, Virginia, took the advice of the State Board of Health and drained all low ground in that vicinity, thus both practically ridding the community of mosquitoes and malaria and increasing the value of the land.

The rearrangement of the Institute of Hygiene and Bacteriology at the German Medicine and Engineering School for Chinese at Shanghai, is under the direction of Dr. Dold, professor of hygiene and bacteriology at Strassburg University, Berlin. Dr. Dold will have a similar professorship at Shanghai.

The Dr. Louis Stevenson Seaman medal has been awarded by the American Museum of Safety to Surgeon General William C. Gorgas for his work in the Canal Zone. Prof. Frederick R. Hutton, in conferring the medal, said that Surgeon General Gorgas had done more for humanity than any other man in this generation.

The epidemic of typhus fever among the Navajo Indians at Canoncito Cojo, New Mexico, has finally been checked. There were 27 cases, with 4 deaths. Dr. Day ordered the destruction of almost the entire settlement and the burning of the Indians' clothes. New huts were put up in another locality and new clothes supplied.

Dr. Mazyck P. Ravenel, professor of bacteriology at the University of Wisconsin and Director of the Wisconsin State Hygienic Laboratory, has resigned and has accepted the professor-

Digitized by Google

ship of bacteriology and preventive medicine at the University of Missouri, formerly held by Dr. Oliver W. H. Mitchell. Dr. Mitchell has become city bacteriologist of Syracuse, New York.

Since the visit of General Gorgas to London and his lectures on his now world-famous method of ridding the Canal Zone of mosquitoes, the London health officers have become awakened to the possibility of and necessity for the destruction of the great quantity of flies in that city. They have appealed to the press for coöperation and hope to interest the public in the movement.

A committee has been appointed to recommend plans for the rebuilding of Ancon Hospital. The members are Capt. R. E. Wood, chief quartermaster, chairman; Dr. A. B. Herrick, acting superintendent of Ancon Hospital, and Mr. Samuel Hitt, canal architect. It is proposed that concrete buildings be erected, with tile roofs and floors. There will be space to accommodate 800 beds, exclusive of those for the insane.

On June 21, the Sunday just preceding the meeting of the American Medical Association in Atlantic City speakers will be furnished under the direction of the Council on Health and Public Instruction for the churches of Philadelphia. Of the 800 churches in the city, it is expected that a large number will observe Public Health Sunday. The plan was tried in Minneapolis and St. Paul last year with great success.

The following officers were elected at the last meeting of the National Association for the Cure and Prevention of Tuberculosis, held in Washington, May 4-8: Dr. George M. Kober, Washington, president; Dr. Lee K. Trankel, New York City, and Dr. Walter Jarvis Barlow, Los Angeles, vice presidents; Dr. Henry Barton Williams, Baltimore, secretary; and Surgeon-General Rupert Blue, U. S. P. H. S., Washington, director.

In the latter part of 1913 the New York City Board of Health requested the Board of Education to allow a health circular con-

Digitized by Google

taining means of preventing contagious diseases to be placed in each school. The request was granted and now the board has asked the Health Department to supply each child with such information. Eight hundred thousand copies in a condensed and simplified form are therefore being prepared for circulation.

The Commission for the Study and Prevention of Malaria of the Southern Medical Association will issue a short treatise on the cure and prevention of malaria, to be printed in all of the leading medical magazines of the South. It is hoped in this way to reach every practitioner in the malaria section of the country. This is the first step of an extensive and systematic campaign against malaria to be carried on by the Commission, of which Dr. C. C. Bass, of New Orleans, is chairman.

Dr. G. M. Guiteras, U. S. P. H. S., has gone to Tampico, Mexico, with the consent of the Constitutionalists, to attempt to improve health conditions in the city. Tampico, none too sanitary nor healthy in time of peace, presents an enormous field of endeavor now, as, on account of strife and the constantly unsettled condition of affairs in that city, it has been some time since native authorities have had the time, chance or inclination to attend correctly to their offices as guardians of the public's health. Yellow fever, malaria, dysentery and other tropical diseases abound in Tampico.

The President of the French Republic has conferred upon Dr. Simon Flexner, Director of the Laboratories of the Rockefeller Institute for Medical Research, the Cross of Chevalier of the Legion of Honor, in recognition of his services to medical science, his discoveries and his administration of the Rockefeller Institute. In 1909, during an epidemic of spinal meningitis in France, Dr. Flexner sent a quantity of anti-meningitis serum to the Pasteur Institute in Paris, by reason of which the epidemic was stopped. Special notice is taken of this in the award.

Dr. S. S. Goldwater, Health Commissioner of New York City, has devised a plan for the periodical medical examination of

Digitized by Google

every person in New York City. Many people with tuberculosis, heart trouble, cancer, etc., consult physicians only when in the last stages of the disease and after the disease has progressed too far for the successful employment of any remedial measures. Insurance companies, corporations and school boards, all having such examinations, have demonstrated their advisability. Those able to pay for the examinations would be required to do so, while those unable to pay would be examined free.

A meeting of the societies for mental hygiene was held in Baltimore, May 25, under the auspices of the National Committee for Mental Hygiene. Dr. Lewellys F. Baker, president of the committee, delivered the opening address. Miss Julia Lathrop, chief of the Children's Bureau, took for her topic "What the Mental Hygiene Societies Ought To Do for Children." "The Conservation of Mental Health—a National Problem," was the subject of an address delivered by Senator George P. McLean, of Connecticut. Dr. William H. Welch, vice president of the committee, spoke on "Some Opportunities of the National Committee for Mental Hygiene."

After the Board of Health had ordered the vaccination of the 138,853 school children of New York City, C. M. Higgins, treasurer of the Anti-Vaccination League of America, published a warning to parents to prohibit the vaccination of their children by "any form of compulsion, intimidation or coercion, or through any false panic created by medical individuals or societies, professionally interested in vaccination." There may be some basis for the existence of anti-vivisection leagues and similar societies, but it is hard to realize that in this day of enlightenment, when the entire country is awake to the benefit and necessity of vaccination, that there can be a society whose object is to combat measures the sole purpose of which is the prevention of disease.

The following is a portion of an appeal made by the *Association ouvrière pour l'hygiène et la sécurité des travailleurs* to the

Digitized by Google

voters in each electoral district and is copied from the Paris Letter of April 17, 1914, of the *Journal of the American Medical Association*:

"France is occupied too much with that side of affairs which concerns the Bourse and the course of shifting values; and too little interested in the side which has to do with life and the course of human values. Witness the last sanitary statistics published by the Minister of the Interior, which state that for every 10,000 persons, France has 178 deaths a year, Germany or England 135. If this coefficient were with us as it is with Germany or England, from 149,000 to 169,000 fewer persons would die in France each year. And yet France is an admirable country, with a rich soil and a temperate climate. The populace is no more destitute or ignorant than in any other country. The medical body is also educated. What, then, is the cause of the evil? In France the health services are rudimentary; in the central administration they are ridiculously scattered in a dozen directions. No one member of the governing body is responsible for the public health, and no one of them cares! The law of 1902 regarding public health is, in almost every department, a dead letter. In the communes the mayors dare not apply the sanitary regulations, and the prefects dare not ask help of the mayors. This is a question of economizing in human lives, to the extent of more than 150,000 a year. . . . Do you think that from any point of view—economic, sociologic, national—the question is negligible? Or do you think, with us, that instead of occupying the last place in the consideration of public officials, this should occupy the first? If you do, make Parliament study the question. Insist that your candidates, of whatever political party, shall promise to urge on the Chamber of Deputies the necessity of serious organization which will further public service along the lines of hygiene in the commune, the department and the state, and above all things, to wage methodical war against those twin scourges which are dishonoring and ruining France—tuberculosis and alcoholism. It is a question of life or death for the nation!"

Public Health Activity.

CALIFORNIA.—The California State Hygienic Laboratory is issuing typhoid vaccine without charge to physicians. Typhoid caused 500 deaths in California in 1913, and this measure is being adopted with the hope that it will lead to the immunizing of a considerable portion of the population. The method of Gay and Claypole, of the University of California, which is said to produce fewer ill effects and to have greater protective qualities, is used. The culture of typhoid bacilli is treated with immune

Digitized by Google

sera, killed with alcohol, ground and the undesirable parts removed.

MICHIGAN.—(*Public Health*, April, 1914.) What can be done by a town in arousing the enthusiasm and interest of the people in health work, was shown in Hillsdale, Michigan, the week of March 15-22, 1914, when a county-wide health convention was held. Through the medium of the local and county papers, circular letters, etc., the coöperation and assistance of people from all parts of Hillsdale County were obtained. The meetings, held each afternoon and evening, were so largely attended that it was necessary to obtain a larger auditorium than that originally provided. Among those delivering addresses were Dr. A. S. Warthin, Ann Arbor; Dr. Elsie S. Pratt, Ann Arbor; Dr. Victor C. Vaughan, Michigan State Board of Health; Dr. Herbert M. Rich, Detroit; and Governor Woodbridge N. Ferris. Great credit is due to the progressive committee who organized this "Good Health Week," and also to the churches and women's clubs who coöperated so heartily with the committee and helped to make the week the great success that it was.

OHIO.—Cincinnati, May 9, 1914. For the last three years the Cincinnati Board of Health has strictly prohibited the use of tobacco in bakeries, with the result that, with frequent sanitary inspections, the majority of the bakeries are in excellent condition. However, violations of the law will occur occasionally. In a few shops bakers allow their men the use of tobacco, warning them whenever the inspectors arrive. Recently a loaf was baked, wrapped and sold to a certain prominent club woman. When cut, the loaf was found to contain several large pieces of chewing tobacco. The Board of Health investigated the matter and learned that seven bakers in the shop were allowed to use tobacco. Fearing the publicity occasioned by a prosecution, the company immediately issued orders that any baker using tobacco would be discharged. With some, public cleanliness is a matter of habit or desire, but with others it seems to be only a question of compulsion.

Digitized by Google

OHIO.—Cincinnati, May 23, 1914. On June 15, ten new milk stations will be opened in Cincinnati. Several schools will be among the buildings utilized for the purpose. This should be an idea for other cities. Instead of building or renting a special building for the use of the stations, the directors, physicians and nurses, a room or so might be set aside in schools in desired localities, especially during the summer months when the schools are used for no other purpose.

In the spring and early summer the chief interest of health departments in the majority of cities is "clean-up week." Each city has its own principal method of interesting the public in the movement; one may display placards, signs, and circulars of all descriptions and in every conceivable place, while another may make a specialty of interesting the children. In New York 800 moving picture theatres lately showed such films as flies as carriers of disease, the care of the baby, and dirt in its relation to insects and disease.

In *Public Health*, May, 1914, published by the Michigan State Board of Health, Dr. William De Kleine has an article on "Our Economic Health." Though the simple, humanitarian side of public health work is sufficient to commend it to the attention of any any physician, there is another equally important side to it—the economic side. Though it is among the poorer class that the greatest human waste is found, it is not primarily their fault. They have never heard of the germ theory of disease. They do not know that flies carry disease. As for cleanliness, its relation to health has probably never occurred to them. Consequently, in the hands of the physician, the public health worker, rests a great part of the responsibility of saving the lives of these people, or rather in teaching them how to save their own lives and the lives of those dependent upon them. Dr. De Kleine makes an appeal to physicians to take more interest in public matters, if necessary to enter politics to gain the desired ends. To quote him: "Can you conceive of a more interesting situation, if 75 per cent of our legislators were physicians? Can you conceive of the interest that the public would take in questions pertain-

Digitized by Google

ing to health, if the presidential campaign issue might be public health instead of tariff or trusts, both of which are insignificant questions when compared with health? Can you imagine how public health problems would move if the great leaders of the States and Nation were medical men? Is such a service not worth careful thought and attention?"

Digitized by Google

CURRENT LITERATURE

RECTAL CANCER IN AN ADOLESCENT.—(*Berl. Klin. Woch.*, No. 12, 1914. *Medical Record*, May 9, 1914.) Cancer of the rectum is rare in early life, but Carl recently reported a case of this sort. The patient was a young Russian, aged 17, who had complained of rectal trouble for a year or more. The evacuations were difficult and painful, and eventually contained pus and blood. A careful examination under ether gave the impression of tuberculosis. However, microscopical examination of the tumor showed that it was cancerous; it was later found to be colloid cancer. As the mass involved the entire circumference of the gut, it was inoperable; and an artificial anus was established to relieve the patient's distress. McShane.

THE BLOOD PRESSURE IN BERI-BERI.—(*Jour. Tokyo Med. Assn., Sei-i-Kwai*, August 10, 1913.) Bariya and Tsujuki made an exact study of blood-pressure in twenty-eight cases of beri-beri, and confirmed the observation that the greatest blood-pressure of the radial artery in patients without any recognizable clinical complications, such as contracted kidney, etc., is smaller than in healthy people. This change is more marked in the cardiac and severe type of the disease, and the blood-pressure of beri-beri patients is inversely proportional to the state of the disease. The increase or decrease of blood-pressure is of value in determining the prognosis.

McS.

FATAL ATTACK OF FILARIAL LYMPHANGITIS SIMULATING BUBONIC PLAGUE.—(*Jour. of the A. M. A.*, Vol. LXII, No. 21, May 23, 1914.) Martinez reports an interesting case of this affection which though rare should always be considered as a possibility in acute attacks of adenitis. The case under discussion was first suspected of being bubonic plague, but due to the rapid onset of symptoms and extreme degree of toxemia, the septicemic form was then suspected. Later examinations gave rise to the possibility of pernicious filariasis, which was confirmed by demonstrating the embryos in the blood and urine, the latter most probably occurring as the result of an acute toxic nephritis, for hematuria was present also. The most interesting lesion occurred in the inguinal region, and to quote the author: "When exposed by dissection the cluster of glands in Scarpa's triangle as well as the inguinal group appeared intensely red and congested, some of them larger than normal, all lightly enveloped in a gelatinous substance, and on section exuded a transparent

Digitized by Google

lymph. The redness and congestion and the lymphatic flow continued under Poupart's ligament along the line of the iliac vessels into the abdominal cavity.'' The embryos were recognized as those of *Filaria bancrofti.* P. L. Querens.

CHAPARRO AMARGOSA IN THE TREATMENT OF AMEBIC DYSENTERY.—(*Jour. of the A. M. A.*, Vol. LXII, No. 20, May 16, 1914.) Nixon, deducting results from the successful treatment of ten cases of amebic dysentery by the use of chaparro amargosa, feels certain that the remedy is almost as efficient and as specific as emetin. Some of the cases had been standing over two years, and readily responded to the treatment. Compared with the action of emetin on amebæ at body temperature, they cease moving immediately and assume a spherical shape on the addition of a 1:10,000 dilution of the detannated extracted; 1:100,000 required 30 to 60 seconds to act, while 1:1,000,000 required from 1 to 3 minutes. These results deserve due consideration, for the cases, except the last treated, were free from symptoms for from ten months to two years, while with the use of emetin we had had frequent recurrences of the disease. Chaparro amargosa is the Mexican name, it meaning ''bitter bush,'' and the plant is indigenous to Southwest Texas and Northern Mexico. It is botanically classified as *Castela nicholsoni* (Hook), and belongs to the family of *Simarubaceae.* The fluid extract of the drug is used in from 1 to 3 fluid drams before meals. P. L. Q.

THE AGGLUTINATION OF M. MELITENSIS BY NORMAL COWS' MILK.—(*Lancet*, March 14, 1914, pp. 737-739.) Basset-Smith, using the original technic of Kennedy, found that a large proportion of mixed milks gave positive reactions, while individual milks from 37 cows gave positive results in 3 samples in one-half hour, 6 in one hour, and 6 by sedimentation; the 3 samples that had reacted positively in one-half hour also reacted positively in one hour, but 2 only reacted by sedimentation; 1 sample reacted positively by sedimentation that had failed to react by agglutination in one-half and one hour respectively. The 32 samples of mixed milks, 5 gave positive reactions in one-half hour and 11 by sedimentation. Saline emulsions of 48-hour cultures of *M. melitensis* with equal parts of unheated milk were used in the above experiments. Dilutions of 1-20 (which are used in Malta) gave less positive reactions than when equal parts were used, and heating to 60° C. for one-half hour tended to eliminate the positive reactions further, and boiling cut out the positive reactions entirely, which must necessarily be expected. Diluting the milk with water instead of saline also cut down the number of reactions. The author urges controlling the reaction by other means also, for the possibility of error can hardly be eliminated. P. L. Q.

Digitized by Google

A STAGE IN THE MIGRATION OF THE ADULT TERTIAN MALARIAL PARASITE. EVIDENCE OF THE EXTRACELLULAR RELATION OF THE PARASITE TO THE RED CELL.—(*Jour. of Exp. Med.*, Vol. XIX, No. 5, May 1, 1914.) The author, Mary Rowley Lawson, reviews her previous publications on the extracellular position of the malarial parasite and states her belief that the parasites are extracellular throughout their existence except for brief periods when they are free in the blood serum, the parasite attaching itself to the red corpuscle by means of delicate pesudopodia thrown out from the cytoplasm of the parasite. After attachment the protoplasm spreads out into ring shape, encircles and squeezes up a mound-shaped portion of hemoglobin, thus maintaining its position while feeding on the hemoglobin composing the mound. She also states the belief that each parasite consumes several red cells during its cycle of development, migrating from one cell to another. The evidence in favor of migration is summed up under the following headings: 1. The great destruction of red corpuscles, which is usually out of all proportion to the number of parasites present in the peripheral blood, provided that each parasite destroys but one corpuscle. 2. Instances of multiple infection of red corpuscles by several young parasites, sometimes many as seven. They cannot all grow on one corpuscle, and even if conjugation were amongst the possibilities, it would not account for odd numbers nor for infection of a corpuscle by parasites of varying stages of development. Therefore if these parasites are not to die they must migrate. 3. What appear to be steps in migration of parasites, which may be summarized as follows: (a) Pigmented parasites free in the blood serum. (b) Pigmented parasites in various stages of development, attached to red corpuscles, the hemoglobin of which is apparently unaltered, many of which being pigmented, giving evidence of one or more previous attachments. (c) Pigmented parasites in various stages of development on decolorized red corpuscles and on corpuscular skeletons. (d) Pigmented parasites partly on and partly off degenerated red corpuscles, caught apparently in the act of abandoning them. (e) Corpuscular skeletons most frequently seen free from parasites. The paper describes principally the extracellular relation of the adult tertian parasite to the red cell seen in one blood smear of a series taken from a malarial patient about 18 hours before the chill. The large number of parasites in this particular smear, showing them to be partly off of the decolorized red cell, are taken to mean a migration to fresh non-infected cells in quest of hemoglobin instead of a condition caused by technic. The photomicrographs are exceptionally good and illustrate very clearly that certain parasites are undoubtedly outside of the corpuscle under the artificial conditions existing in these preparations. The colored plate and photomicrographs do not show any red cells recently infected by at least half-grown parasites. F. M. Johns.

Digitized by Google

A NEW MALARIAL PARASITE.—(*Annals of Trop. Med. and Parasit.*, Vol. VIII, No. 1, April 24, 1914.) J. W. W. Stephens presents a study of a blood film from a malarial patient in Pachmari, Central Provinces, India. These particular parasites exhibited a peculiar irregularity of contour as compared to either *Plasmodium vivax* or *Plasmodium falciparum* of the young ring or post-ring stages, many different specimens of which were studied as controls. The differentiation from *P. falciparum* was made by the extreme irregularity beyond the ordinary bacillary or "starfish" shapes, and the abundance and irregularity of the chromatin; from *P. vivax* by a smaller bulk, ameboid processes being more delicate, a relatively larger amount of chromatin having a very irregular shape as well as the protoplasm, and the absence of typical rings. Doubt is expressed as to any change in size or color of the red cell and the production of pigment other than the finding of several pigmented leucocytes. One infected cell, of the many thousands encountered, was clearly enlarged and showed Schüffner's granules. *Plasmodium tenue* is the proposed name for the parasite. F. M. J.

A NOTE UPON THE OCCURRENCE OF A PLASMODIUM IN THE BLOOD OF WEST AFRICAN MONKEYS.—(*Annals of Trop. Med. and Parasit.*, Vol. VIII, No. 1, April, 1914.) H. Seidelin and A. Connal mention the importance of the recent discussions of Blanchard and Langeron, and Léger and Bouillez as to the possibility of monkeys possessing an acquired immunity towards plasmodium infections, the infection having taken place in the young monkey, and present the blood finding from three young monkeys caught in Southern Nigeria. Two of these monkeys were *Papio sphinx* and one was a *Cercopithecus mona*. All three showed the presence of pigment-containing parasites evidently belonging to the genus *Plasmodium*. The majority of the parasites were gametes, and in one case there were apparently no schizonts. No attempt was made to determine the species of *Plasmodium* other than that they differed in several respects from those of the human being. Mention is also made of the finding by Seidelin of a plasmodium in a monkey in Yucatan, Mexico, in which case an intermittent fever was observed. The question of immunity in protozoal diseases as well as the presence of animal reservoirs for human species of plasmodium, at least in tropical countries, makes the above report particularly interesting in view of the almost constant negative findings of corpuscular parasites in monkeys exposed to the very best of environments for insect-borne diseases of this type. F. M. J.

THE ORIGIN AND DEVELOPMENT OF GAMETES (CRESCENTS) IN MALIGNANT TERTIAN MALARIA: SOME OBSERVATIONS ON FLAGELLATION, ETC.—(*Annals of Trop. Med. and Parasit.*, Vol. VIII, No. 1, April, 1914.) (David Thomson.) This paper, constituting Part II of the report of the Malarial Expedition to Panama sent out from the Liverpool School of Tropical

Digitized by Google

Medicine, deals with a series of studies on (a) crescents in the peripheral blood; (b) parasites found in autopsy smears from the inner organs; and (c) on the flagellation of the microgametocytes. The studies of crescents in autopsy smears were made in conjunction with Dr. W. M. James, of Panama, as well as the studies from specimens prepared by the moist chamber method. The report contains a mass of very important detail, upon which the following summary is made. The points brought out are very clearly illustrated by the accompanying colored plate.

Summary: Study of crescents from the peripheral blood.—Crescents are produced from asexual spores of *P. falciparum*, due to development of immunity towards the latter. They develop somewhere in the internal organs, and then suddenly appear in the peripheral blood. They are developed in about ten days. Crescents do not generally live more than a few days in the peripheral blood. They may be found in the peripheral blood for as long as eight weeks by replenishment from surviving asexual forms. On the tenth day following an asexual sporulation the crescents appear in the circulation. Quinine has no action against crescents at any time, but destroys the asexual parasites, which are the source of supply. Twenty grains of quinine daily reduces the crescents to less than one per cubic millimetre of blood in three weeks.

Study of sexual parasites found in autopsy smears from the inner organs. Crescents take ten days for their formation in the bone marrow and spleen. The protoplasm of crescents in all stages of development stains a faint grayish-blue in contrast to the deep blue of schizonts. The chromatin is less abundant, more finely granular, and never breaks up into masses. The pigment appears in the youngest forms and remains scattered until the adult stage. The shape of the younger forms is round, varying to oval and crescentic as the adult stage is reached. Crescents were found in spleen and bone marrow after an eleven-day course of quinine, 45 grains daily, had been given. Malarial pigment has been noted in spleen and marrow after 47 days' quinine treatment of 30 grains daily. No evidence of parthenogenesis in crescents was obtained.

Studies on flagellation.—Crescents become spherical about 4 minutes after blood is drawn, which appears to be coincident with the time of coagulation. Crescents do not become spherical or flagellate in blood prepared for cultures according to the method of Bass and Johns. They may flagellate in from 4 to 50 minutes. Crescents will still flagellate in patients subjected to thorough and continuous quinine treatment. The spherulation of crescents is probably due to osmosis, and this probably stimulates flagellation. Chromatin polar bodies are seen in crescents which have become spherical. Four, six, eight or ten microgametes may be formed. There is no evidence for the belief that crescents ever flagellate in the circulating blood of a patient. F. M. J.

Digitized by Google

NOTES ON INFANTILE KALA-AZAR.—The following is the substance of views, recently published (Dr. Laganne, *Journal de Med., et de chir., pratiques,* March 25, 1914, p. 229; Dr. C. M. Wenyon, *Journal of Trop. Med. and Hyg.,* March 2, 1914, p. 68), which broaden and at the same time focus the subject of *leishmaniasis* on some practical deductions. Indeed, while no curative measure against this dreadful infection can, as yet, be reported effective, in man (the mortality still being from 96 to 98.5 per cent), at least definite prophylactic measures are plainly indicated. Infantile kala-azar is not a distinct leishmaniasis, peculiar to children, limited to the Mediterranean shores, since clinically and etiologically it does not differ from kala-azar in adults, elsewhere, in old and new foci. Kala-azar has traveled in all parts of the world with infected dogs and individuals. All foci, new and old, are linked up, the world over, and the only cause is the same identical organism, *Leishmania donovani*, in man and beast. Dogs can be infected experimentally with virus, both from Indian and Mediterranean cases, so the supposed difference between the two types no longer exists. It is the same leishmaniasis in Europe, Africa, Asia and America (Paraguay). Canine and human diseases are the same. But, a human being must not necessarily be infected from a dog. An infected child is dangerous, not only to other children with whom it may come in contact, but also to dogs, in just the same way as an infected dog is dangerous to other dogs and children. While the discussion on transmission by fleas (bites and feces of human flea, *Pulex irritans*, and canine flea, *Ctenocephalus canis*) is not closed, the war on fleas is indicated. In endemic districts the number of useless dogs should be restricted. In Tunis 1.8 per cent, in Malta 10 per cent, in Greece 19.75 per cent, in Sicily, at Bardanaro, near Messina, 81 per cent of dogs examined were infected. The difficulty in the execution of prophylactic measures lies in the fact that canine leishmaniasis is latent. Infected dogs show no evidence of systemic effects. The spleen is not sufficiently hypertrophied to be palpated; there is no loss of weight. The disease in dogs is much less severe and recovery takes place, spontaneously, quite often. But, all skinny dogs with alopecia patches are very suspicious, much more so when they present a weakness, and, at times, a paralysis of the hind legs (last stage). Wherever in the old endemic districts of the Mediterranean, infected children have been strictly isolated, and roaming dogs, unhealthy or not, have been caught, tested (examination of liver material obtained by puncture, and of bone marrow obtained by trephining in the epiphysis), and have been killed when the test was positive, the number of cases of kala-azar has been reduced. E. M. Dupaquier.

Digitized by Google

NEW METHOD OF TREATING LEPROSY.—Heiser (*N. Y. Med. Journ.*, May 16, 1914, quoting *Journal Tropical Med. and Hyg.*), offers a formula for the hypodermatic treatment of leprosy with chaulmoogra oil. This oil has been used before by subcutaneous injection; as long ago as 1890, this method was practiced by Blanc in the New Orleans Charity Hospital. Heiser's formula, however, carries other substances which may have some influence in his results. The following is suggested:

Chaulmoogra oil, camphorated oil, 2 ounces of each; resorcinol, one dram.

Mix, dissolve with aid of heat on water bath and then filter.

Thirty drops (2 c. c.) of this mixture was given in one case every 3 days for a month; then 80 minims (5 c. c.) every 8 days during a second month. The dose was then increased to 160 minims (10 c. c.) every 8 days; this was borne badly, so the dosage was decreased to 80 minims (5 c. c.) every 8 days, and was kept up for 3 months. At the close of this period, all evidence of leprosy had disappeared, microscopical as well as clinical. At the end of a year the patient was still apparently well, so, a course of nine months of injections (30 minims every 10 to 13 days) was followed, and the patient was discharged. A second case showed similar results, but the facies remained suffused. Other patients under like treatment did not show the same improvement. Dyer.

ELEPHANTIASIS.—A case of elephantiasis successfully operated on, with continuous post-operative improvement, is reported by H. A. Royster, Raleigh, N. C. (*Journal A. M. A.*, May 30, 1914), who specially testifies to the benefit derived from the operation described by the Greek surgeon, Kondoleon. The enlargement was confined to the right lower leg and foot. The circumference of the calf was 22 inches, above the ankle 18 inches, and of the foot 14 inches. The skin was hard, thick and rough and the diagnosis of elephantiasis unmistakable. "For four days previous to the operation the man was put to bed; each day the leg and foot were scrubbed in a strong mercuric chlorid solution, bandaged tightly with a canton flannel roller and kept elevated on pillows. As a result of this, the leg was reduced in size about 2 inches. January 3, 1914, the operation was performed as follows: A long incision was made through the skin on each side of the leg, extending from the knee to the ankle. Wide retraction of the integument was secured by dissecting it back freely from each edge of the incision. Going from above downward the deep fascia to the width of three fingers was dissected off the muscles and cut away in one piece of the length of the wound. Also, the same area of subcutaneous tissue was removed by splitting it off the skin. The muscles were laid bare and free hemorrhage occurred, requiring many ligatures. The skin was stitched back in position, dressings applied and the leg bandaged without a splint." The auxiliary treatment consisted in the hypodermic administration of thiosinamin every three days over a period

Digitized by Google

of two weeks while the patient was in bed. About three months later an intravenous injection of salvarsan was given empirically to combat any microbic or parasitical infection, though they had been unable to demonstrate such. The principle involved in the Kondoleon method is that by removal of the deep fascia there is brought about an anastomosis between the deep and superficial lymph spaces. The foot in this case is still enlarged and another operation is recommended, provided it can be performed without injury to the tendons.

RESULTS OF RADIUM IN CANCER.—H. H. Janeway, New York (*Journal A. M. A.*, May 30, 1914), reviews the results of treatment of cancer by radium, noting the work of Wickham of Paris, which seems to indicate that while the influence of radium on all types of cancer is a favorable one, it does not extend to the limits of the disease in any but the most superficial forms. Wickham's works cover 1,000 cancer cases thus treated. The work of the Radium Institute of London covers 460 cases of cancer during 1912, none of which are reported as cures, though some of them may later prove to be such. Out of 101 cases of slow growing benign forms of skin cancer, 31 patients were apparently cured for the time, and 41 improved. But in cancer of the rest of the body there were only 15 apparently cured. The results also confirm the observations of Wickham. The less extensive test of radium in cancer at Vienna leads to the same general conclusions. While Wickham's reports show some enthusiasm, the German reports are very conservative, and the London Radium Institute is noncommittal. All, however, show a remarkable agreement as regards results. While radium will destroy cancer tissue in a dosage not affecting normal tissues, it does not cure the disease unless the cancer is quite superficial or of a very susceptible type. We may cherish a hope that greater success may be had in the future, but at present radium can only supplement the knife.

A PRACTICAL METHOD OF DRYING CULTURES OF BACTERIA.—Office of Information, U. S. Department of Agriculture, Washington, D. C.—All the better classes of creameries use for ripening cream pure cultures of bacteria which are obtained at regular intervals from commercial laboratories. These are carried in the creameries by transferring milk cultures from day to day, the culture being renewed occasionally to insure its purity. The small milk culture, known as a "mother starter," is usually carried in bottles or small jars, from which it is transferred to a large can or vat of milk to make the starter used to ripen the cream.

The ideal culture for distribution is in a dry form, sufficiently active to produce rapid growth when it is added to milk, and yet so dormant that it can be held a long time without losing its activity. But the difficulties of producing a culture in this condition are so great that the most successful of the commercial cultures are distributed in a liquid medium

Digitized by Google

and must be used within a comparatively short time. A few cultures, however, have been sold continuously in a powder or tablet form; in other cases the liquid culture has been found to be more satisfactory and the dry culture has been abandoned.

Recently the general interest in fermented milks, especially those of the Yoghourt type, has stimulated the production of various kinds of tablets and capsules which ostensibly contain the organism in such quantities that the culture can be used to start a fermentation in milk or to inoculate the digestive tract by direct consumption. These cultures, as well as those sold for buttermaking and cheesemaking, are of real value only when they contain a suitable organism free from contamination and are sufficiently active to start the acid fermentation before accidental contamination can develop to an appreciable extent.

The butter cultures sold in the dry form are powders or tablets, sometimes prepared with a filler of starch or lactose, or are milk cultures dried and pulverized.

It is obvious that in the ordinary process of drying cultures there is a great decrease in the number of bacteria originally present in the culture, and it is probable that there is a still further loss as the culture is held after drying.

As a result of recent experiments the Dairy Division of the Bureau of Animal Industry, United States Department of Agriculture, has devised a method of drying cultures by which the loss in bacterial content is greatly reduced. Experiments in removing the water by a spray carried up by a current of warm dry air were found to produce satisfactory dry cultures, but rapid drying by this process requires the use of complicated and expensive machinery not within the reach of the ordinary laboratory.

Cultures were then successfully evaporated by freezing and lowering the atmospheric pressure. Phosphorus pentoxid and lime were used to absorb the moisture, but sulphuric acid proved to be the best agent for this purpose.

These experiments show conclusively that water may be removed from cultures of bacteria used in the manufacture of dairy products by exposing them in a frozen condition over sulphuric acid in a vacuum approximating 0.01 mm.

Fresh lactic cultures dried by this method are sufficiently active to curdle milk in 17 hours at 30° C. when added in the ratio of 1 part of powder to 1,000,000 parts of milk.

The total number of bacteria in a milk culture may be increased by adding dibasic potassium phosphate, but the powder made from the culture is less active than that made from unneutralized milk. The activity of the powder is not increased by neutralizing the culture with calcium carbonate before drying.

More powder may be produced at each operation of the dryer by using

Digitized by Google

a culture grown in milk concentrated to one-half its original volume, and this powder is as active as that made from normal milk.

The activity of a dried culture diminishes more or less rapidly, depending on the conditions under which it is held. The loss of activity in powders is much more rapid when the moisture content is comparatively high. The loss in activity is very slow at 0° C. or lower, and becomes more rapid as the temperature is increased. Dried cultures of the lactic-acid bacteria held at 30° or 37° C. become inactive in a short time. Cultures held in a vacuum retain their activity much better than cultures in an atmosphere of nitrogen or hydrogen; the most rapid loss of activity takes place either in air or in an atmosphere of oxygen.

Very active dried cultures of *Bacillus bulgaricus* may be made by the freezing-vacuum method; they curdle milk in 20 hours at 37° C. when added to milk in the ratio of 1 to 100,000.

The nitrogen-fixing bacteria may be dried with a smoll loss by the freezing-vacuum method.

Yeasts evidently do not survive the process, for the powders obtained were very feeble.

Digitized by Google

PUBLICATIONS RECEIVED

Under this Department all titles received will be acknowledged and those considered by the Editor as of special interest to the readers of this JOURNAL will be reviewed.

Archivos de la Sociedad de Estudios Clinicos de la Habana, Numero 12, Diciembre, Toma, XX.

MANUAL OF LABORATORY METHODS. By E. M. Perdue. Second edition, revised and enlarged. Buton Publishing Co., Kansas City, Mo. 1914.

TATE, W. K. The New Country School: A Survey of Development, and Foster, W. D., The Youth's Companion and School Improvement. Printed by *Youth's Companion*, Boston, Mass.

REPRINTS.

ALBERT, HENRY, and SCHEETZ, MILDRED E. Model Laboratory for the General Practitioner. Reprinted from *Journal of the Iowa State Medical Society*, May, 1914.

COFER, L. E. Quarantine Procedure. Reprinted from Public Health Bulletin No. 64, February, 1914.

ERICHSEN, HUGO. Cremation versus Earth Burial. An address delivered at the Indianapolis Crematorium, September 27, 1913, and at the Carnegie Institution, Pittsburgh, December 13, 1913.

LOW, GEO. C. Recent Researches on Emetine and Its Value as a Therapeutic Agent in Amebiasis and Other Diseases. Reprinted from Proceedings of the Royal Society of Medicine, 1914, Vol. VII (Therapeutical and Pharmacological Section).

WU LIEN-TEH (G. L. Tuck.) First Report of the North Manchurian Plague Prevention Service. Reprinted from the *Journal of Hygiene*, Vol. XIII, No. 3, October 24, 1913.

PRINTED AT THE TULANE UNIVERSITY PRESS, NEW ORLEANS, U. S. A.

Digitized by Google

Digitized by Google

American Journal Tropical Diseases and Preventive Medicine

INDEX OF VOLUME 1, JULY, 1913, TO JUNE, 1914

A.

Absence of Luetin Reaction on Lepers Showing a Positive Reaction..... 738
Acid Saturation in General Infectious Fevers 661
Acute Agchylostomiasis Treated by an Autogenous Vaccine of a Coliform Organism —Case of..... 260
Acute Pellagra or Dermatitis Exfoliativa..... 474
Administration of Emetine to Young and Debilitated Children, by Nathan Barlow.... 864
Agamomermis restiformis, Stiles, from the Human Urethra—By A. J. Smith and O. E. Denny..... 281
Agglutination of M. melitensis by Normal Cow's Milk..... 884
Agglutination Reaction in Dysentery..... 413
Ainhums as Seen on the Canal Zone, with Report of Interesting Cases Occurring in One Family..... 417
Alcohol and Tobacco Related to Longevity.... 810
Allan, William—Progress Report in the Use of Emetine in Amebic Dysentery..... 565
Amebic Dysentery of Thirteen Years' Duration Cured by Emetine Hydrochloride—Case of..... 664
American Society of Tropical Medicine—Biographical Sketch of Roland Gideon Curtin, M. D..... 250
Eleventh Annual Meeting..... 870
Is the Importance of Intestinal Parasites in Tropical Pathology Exaggerated?..... 169
Secretary's Report—By John M. Swan..... 86
Ankylostomiasis—By C. M. Fauntleroy..... 677
Animal Trypanosomiasis in Nigeria..... 101
Announcement—*Editorial* 539
Antagonistic Substances of Experimental Polyneuritis 178
Antityphoid Vaccination..... 595
Antityphoid Vaccination an Established Measure in Preventive Medicine—*Editorial* 757
Apoplectic Malaria—Case of..... 185
Apparent Identity of Agchylostoma ceylanicum (Looss. 1911), and Agchylostoma braziliense (Favia, 1910)..... 475
Appendicitis from Helminths..... 185
Ashford, Bailey K.—Notes on Sprue in Porto Rico and the Results of Treatment by Yellowed Santonin..... 146
Attempts to Transmit Poliomyelitis by Means of the Stable Fly (Stomoxys calcitrans).. 415

B.

Bacterial Pollution of the Mississippi River Water.—By H. E. Lemoine..... 362
Bacteriological Study of the Water Supply of New Orleans.—By C. L. Jacob..... 300
Barlow, Nathan—Administration of Emetine to Young and Debilitated Children..... 864
Epidemic Climatic Bubo..... 787
Impetigo Tropica..... 789
Rheumatic Malarial Fever..... 865
Ulcus Interdigitalis foetidum..... 868
Bass, Charles Cassedy—Cultivation of Malarial Plasmodia in vitro..... 546
Bass C. C. and Johns, F. M.—Cultivation of Malarial Plasmodia (Plasmodium falciparum) in vitro in the Blood of a Diabetic without the Addition of Dextrose.... 246
Bass, C. C., and Wellman, Creighton.—Polyneuritis gallinarum Caused by Different Foodstuffs 129
Beri-beri—By Paul G. Woolley..... 711
Beri-beri in British Soldiers..... 186
Beri-beri in East Africa..... 260
Beri-beri in Nigeria..... 187
Biology of Some North American Ticks of the Genus Dermacentor..... 474
Biology of Tabanus striatus fabricius, the Horsefly of the Philippines..... 473
Blood Changes in Verruga and Oroya Fever.. 806
Blood Pressure in Beri-beri..... 883
Brewer, Isaac W.—Some Thoughts upon the Prevention of Malaria and its Relation to the Drainage of Swamps and other Collections of Water..... 861
Bronchial Spirochetosis..... 476
Bubonic Plague in California.—*Editorial*..... 265

C.

Carter, H. R.—Some Educational Methods for Use in Anti-malarial Work..... 848
Chamberlain, Weston P.—Character of the Rice Which Prevents Beri-beri and the Manner in Which It Is Milled..... 121
Some Features of the Physiological Activity of Americans in the Philippines..... 12
Chantemesse, Prof. A.—Preventive Vaccination against Typhoid; tr. by Charles Chassaignac 720
Chaparro Amargosa in the Treatment of Amebic Dysentery..... 884
Character of the Rice Which Prevents Beriberi and the Manner in Which It Is Milled.—By W. P. Chamberlain..... 121
Chatard, J. A., and Guthrie, C. G.—Human Trypanosomiasis: Report of a Case Observed in Baltimore..... 493
Cholera in the Balkans..... 186
Cholera and Drinking Water in the Balkans.. 188
Cholera: the Aftermath of the Balkan War—*Editorial* 263
Chronic Bacillary Dysentery.—*Editorial*..... 751
Classification of Amoebæ—By Charles F. Craig 351
Color Marking and Other Variable Characters of Anophelines..... 100
Concerning the Active Immunity of the Dog against Canine Piroplasmosis (Babesia canis) 476
Concerning the Beri-beri Preventing Substanecs or Vitamines Contained in Rice Polishings 598
Concerning the Sex and Age of Aricans Suffering from Trypanosomiasis..... 805
Congress on Tropical Medicine.—*Editorial*..... 193
Conservation of Public Health..... 595
Cost of Preventable Disease.—*Editorial*..... 343
Craig, Charles F.—Classification of Amoebæ.... 351
Culpepper, William Louis.—Case of Dhobie Itch (Tinea cruris), with Notes on the Cultivation of the Causal Fungus (Epidermophyton rubrum)..... 397
Dhobie Itch (Tinea cruris)—Case of..... 584
Cultivation of the Bacillus of Leprosy: A Review.—By Paul G. Woollev..... 580
Cultivation of Malarial Plasmodia in vitro.—By C. C. Bass..... 546
Cultivation of Malarial Plasmodium in vitro in the Blood of a Diabetic without the Addition of Dextrose.—By C. C. Bass and F. M. Johns..... 246
Cultivation of Plasmodia and Piroplasma in vitro 180
Cultivation of the Comma Bacillus from the Lung in a Case of Cholera..... 806
Culture of Babesia (Piroplasmosa) canis in vitro 663
Culture of Malaria Parasites by Bass's Method 336

D.

Deaderick, William H.—Health Survey..... 627
Suggestions on the Annual Report of the City Health Department..... 573
Demonstration of the Fusiform Bacilli and Spirilla of the Mouth..... 660
Denny, Oswald E., and Smith, A. J.—Agamomermis restiformis (Leidy), Stiles, from the Human Urethra..... 281
Detection of Trypanosomes in Animals..... 803
Dhobie Itch—Case of.—By W. L. Culpepper 397
Dhobie Itch (Tinea cruris)—By W. L. Culpepper 584
Diabetes 413
Diabetes insipidus—Complicating Malaria..... 739
Diagnosis and Treatment of Dysenteric Abscess of the Liver..... 256
Differential Blood Count in Dengue..... 102
Disease Carriers among School Children.—By E. O. Jordan..... 220

Digitized by Google

Duty of the Federal Government in Leprosy—*Editorial* 425
Dyer, Isadore.—The Way to Vaccinate..... 447

E.

Early Bony Lesions in Leprosy as Shown by Radiographs 658
Echeverria, Emilio.—Innocuous Bites of Malaria and Yellow Fever Mosquitoes during the Daytime..... 625
Echinococcus in the Spleen..... 182
Effect of Cold upon the Larvae of Trichinella spiralis 664
Effects of Certain Drugs on the Pathogenic Entamoebae of the Human Intestines.—By W. M. James..... 431
Elephantiasis 889
Elephantiasis of Scrotum..... 527
Elephantiasis, with a Report of a Case..... 738
Emetine 181
Emetine in Abscess of the Liver..... 657
Emmerich's Hypothesis Regarding Cholera.... 412
Enteric Fever in Indians, with Special Reference to its Occurrence in the Indian Army 655
Epidemic Cerebrospinal Meningitis in Nairobi 594
Epidemic Climatic Bubo.—By Nathan Barlow 787
Epidemic of Beri-beri among Japanese Fishermen 179
Epidemic of Paratyphoid.—By A. N. Sinclair 612
Epidemic Trichonocardiasis..... 742
Epidemiology of Sleeping Sickness..... 182
Eruption of Variola and Vaccinia in the Monkey and the Buffalo..... 474
"Espasmo Tropical." A Peculiar Disease of Great Malignancy Associated with a Parasite in the Blood..... 805
Etiological Study of Hodgkins Disease..... 663
Eustis, Allan C.; Wellman, Creighton, and Schochet, S. S.—Malta Fever in Louisiana 393
Rapid Cure of Polyneuritis Gallinarum..... 295
Report of a Case of Long-standing Amebic Abscess of Liver and Lung..... 520
Experimental Balantidiasis..... 598
Experimental Entamebic Dysentery..... 598
Experimental Infection of Mule with Trypanosoma hippicum by Means of Musca domestica 411
Experimental Pellagra in a Monkey..... 258
Experiments of the Transmission of Human Trypanosomes of Africa by Means of the Stegomyia fasciata..... 658

F.

Fatal Attack of Filarial Lymphangitis Simulating Bubonic Plague..... 883
Fauntleroy, C. M.—Ankylostomiasis (or Hookworm Disease)..... 677
Filterability of the Virus of Trachoma..... 177
Free-living and Parasitic Amoebae and their Relation to Dysentery.—By E. R. Whitmore 197
Frequency of Filaria bancrofti in Subjects Free from Elephantiasis and Lymphatic Complications 742
Functions of a Modern Hospital..... 809
Further Experiments with Beri-beri in the Philippine Islands.—By Victor G. Heiser 119

G.

Glanders-like Disease Occurring in Rangoon.. 100
Galyl in Trypanasomiasis..... 475
General Action of Quinine in the Treatment of Amebic Dysentery..... 738
Graham, L. W., and Hutchison, R. H.—Influence of Experimental Trypanosomiasis upon the Body Temperature of White Rats 760
Growth of Filarial Embryos in vitro.—By F. M. Johns and P. L. Querens..... 620
Guiteras, Juan.—White Race and the Tropics, The 159
Gurd, Fraser B.—Relationship of Anaphylaxis to Immunity..... 776
Guthrie, C. G., and Chatard, J. A.—Human Trypanosomiasis 493

H.

Haemophagous Species of the Genus Musca, Description of two new Species..... 411
Health Officer's Obligations, The—*Editorial*.. 609
Health Survey.—By W. H. Deaderick..... 627
Heiser, Victor G.—Further Experiences with Beri-beri in the Philippine Islands..... 119
Hitchens, A. Parker.—Serums and Vaccines in the Prevention and Treatment of Undulant Fever..... 228
Holmes, Bayard.—Outlook for Dementia Precox: the Plaintiff's Plea..... 516
Honor to Dr. Bass—*Editorial*..... 114
Hookworm Disease: a World Disease of Long Duration—*Editorial* 669
Human Trypanosomiasis.—By J. A. Chatard and C. G. Guthrie..... 493
Hutchison, R. H., and Graham, L. W.—Influence of Experimental Trypanosomiasis upon the Body Temperature of White Rats 760
Hygiene of To-day—*Editorial*..... 543
Hygiene in the Philippine Schools.—By Allan J. McLaughlin..... 462

I.

Impetigo Tropica.—By Nathan Barlow..... 789
Indian Journal of Medical Research—*Editorial* 265
Infantile Leishmaniosis Followed by Cure—Case of. Leucocytic Formula of Leishmaniosis 477
Influence of Cultivation in Serum-Containing Media upon the Virulence and Immunising Properties of the Plague Bacillus..... 665
Influence of Experimental Trypanosomiasis upon the Body Temperature of White Rats.—By L. W. Graham and R. H. Hutchison 760
Influence of the Medium in Which the Plague Bacillus is Propagated upon the Facility with Which It Is Ingested by Human Leucocytes 665
Influence of Water-borne Disease on the Mortality of Children.—By A. J. McLaughlin 504
Innocuous Bites of Malaria and Yellow Fever Mosquitoes during the Daytime.—By Emilio Echeverria..... 625
Insects and Disease.—*Editorial*..... 346
Intestinal Flora of the Adult Stegomyia fasciata 596
Intestinal Parasites Encountered in Five Hundred Autopsies, with Reports of Cases 598
Intravenous Medication in Relapsing Fever... 808
Investigation of an Epidemic of Cholera Caused by a "Carrier"..... 804
Investigation of Pellagra.—*Editorial*..... 491
Investigation on the Occurrence of the Cholera Vibrio in the Biliary Passages... 803
Investigations as to the Relationship of the Tarbagan (Mongolian Marmot) to Plague 656

J.

Jacob, Charles Louis.—Bacteriological Study of the Water Supply of New Orleans..... 300
James, W. M.—Effects of Certain Drugs on the Pathogenic Entamoebae of the Human Intestines..... 431
Japanese River Fever—Etiology..... 415
Johns, Foster M., and Bass, C. C.—Cultivation of Malarial Plasmodia in vitro in the Blood of a Diabetic without the Addition of Dextrose..... 246
Johns, F. M., and Querens, P. L.—Further Note on the Growth of Filarial Embryos in vitro..... 620
Johns, Foster Matthew.—Occurrence of the Trichonocardiases in New Orleans..... 782
On the Adult Forms of Trypanosoma americanum in Naturally Infected Animals 49
Jordan, Edwin O.—Disease Carriers among School Children..... 220

Digitized by Google

K.

Kala-azar Treated with Arsenic..... 187
King, Howard D., and Wellman, Creighton. —List of the Mosquitoes hitherto Reported from New Orleans..... 267
King, Willard V.—Note on the Mounting of Mosquito Larvae..... 403
Knab, Frederick.—Life-History of Dermatobia hominis..... 464
Species of Anopheles that Transmit Human Malaria—The..... 33
Correction of Article on page 33..... 227

L.

Lemoine, Henry Eugene.—On the Bacterial Pollution of the Mississippi River Water by the Sewage Effluent from the City of New Orleans..... 362
Leprosy of Rats in New Caledonia—Note on 473
Life-history and Habits of Spalangia muscidarum Richardson, a parasite of the Stable Fly..... 476
Life-history of Dermatobia hominis.—By Frederick Knab..... 464
List of the Mosquitoes hitherto Reported from New Orleans.—By Creighton Wellman and Howard D. King..... 267
Lovelace, Carl.—Peripheral Neuritis in the Amazon Valley..... 140
Low Proteid Diet..... 411
Luetin 600

M.

McCulloch, Hugh.—Notes on Cestode Monstrosities; with a Report of a New Case of Taenia saginata with Y-shaped Proglottides 453
McLaughlin, Allan J.—Hygiene in the Philippine Schools..... 462
Influence of Water-borne Disease on the Mortality of Children..... 504
Madura Foot with Involvement of Scarpa's Triangle and the Lower Part of the Abdominal Wall..... 473
Malaria and Suppurative Hepatitis..... 185
Malarial Investigations in the United States by the U. S. Public Health Service.—By R. H. Von Ezdorf..... 855
Malta Fever in Louisiana.—By Creighton Wellman, Allan Eustis and S. S. Schochet 393
Matas, Rudolph.—Surgical Treatment of Elephantiasis and Elephantoid States Dependent upon Chronic Obstruction of the Lymphatic and Venous Channels.... 60
Mechanical Transmission of Surra by Tabanus striatus Fabricius..... 477
Metabolism in Pellagra..... 259
Meteorology of Malaria..... 411
Mexican Situation, The—*Editorial*..... 820
Moore, Alfred.—Remarkable Emaciation in a Case of Hookworm disease..... 294
Morphology of the Plague Bacillus..... 739
Mosquito Reduction and the Consequent Eradication of Malaria..... 594
Mounting of Mosquito Larvae.—By W. V. King 403

N.

Nastin in Leprosy..... 602
Nastin Treatement of Leprosy..... 419
Neurasthenia and its Bearing on the Decay of Northern Peoples in India..... 526
New Human Parasite, Agchylostoma ceylanicum 334
New Malarial Parasite..... 886
New Method of Treating Leprosy..... 889
New Pathogenic Organism in Man..... 102
New Species of Philaematomyia, with remarks on the genus..... 411
Note on Beri-beri..... 743
Note upon the Occurrence of a Plasmodium in the Blood of West Indian Monkeys.... 886
Notes on Cestode Monstrosities.—By Hugh McCulloch 453
Notes on Infantile Kala-azar..... 402
Note on Pinta.—By J. E. Smith..... 402
Notes on Sprue in Porto Rico and the Results of Treatment by Yellowed Santonin.—By Bailey K. Ashford..... 146

O.

Observations on Certain Helminths of Man.... 420
Observations on the Mechanism of the Transmission of Plague by Fleas..... 739
Occurrence of the Trichonocardiases in New Orleans.—By F. M. Johns..... 782
On the Adult Forms of Trypanosoma americanum in Naturally Infected Animals. —By F. M. Johns..... 49
Oriental Sore in the Americas, with Report of a Case..... 745
Origin and Development of Gametes (Crescents) in Malignant Tertian Malaria; Some Observations on Flagellation, etc.
Origin and Present Status of the Emetine Treatment of Amebic Dysentery..... 663
Oroya Fever and Peruvian Wart.—*Editorial*.. 605
Outlook for Dementia Precox: the Plaintiff's Plea.—By Bayard Holmes..... 516

P.

Parallelism between the Cholera Vibrio and the El Tor Vibrio..... 177
Parasitic Amoebae..... 100
Parasitic Thyroiditis..... 529
Pellagra: a Summary of the First Progress Report of the Thompson-McFadden Commission 526
Pellagra Produced in a Monkey..... 179
Peripheral Neuritis in the Amazon Valley.— By Carl Lovelace..... 140
Phlebotomus Papataci, the Transmitter of the "Three-days Fever"—*Editorial*..... 815
Plague. The Epidemiological Features of Bubonic and Pneumonic Plague Contrasted 655
Practical Method of Drying Cultures of Bacteria 890
Precipitation of Bacterial Protein by Concentrated Solution and its Relation to the Bacteriological Diagnosis of Cholera 807
Preliminary Note on a New Flagellate, Crithidia hyalommae, Sp. Nov., Found in the Tick Hyalommae aegyptium (Linnaeus, 1758)..... 334
Preliminary Note on the Occurrence of the Comma Bacillus in the Urine of Cases of Cholera..... 803
Presence of Acid-fast Bacilli in Secretions and Excretions of Lepers..... 738
Present State of the Study of Beri-beri in Japan 656
Prevention of Cancer.—*Editorial*..... 489
Preventive Medicine and Syphilis.—*Editorial* 671
Preventive Vaccination against Typhoid.— By Prof. A. Chantemesse; tr. from French by Charles Chassaignac..... 720
Probable Identity of Trypanosoma congolense (Broden) and T. nanum (Laveran) 663
Progress Report in the Use of Emetine in Amebic Dysentery.—By William Allan 565
Properties of the Virus of Trachoma..... 177
Prophylaxis of Measles..... 811
Protozoa-like Structures in the Blood of Blackwater Fever..... 186
Public Interest in Hygiene.—*Editorial*..... 195
Pyosis Tropica in the Anglo-Egyptian Sudan 803

Q.

Quarterly Report of the Bureau of Health for the Philippine Islands, Third quarter, 1913..... 664
Querens, Percy Leonard, and Johns, F. M. —Further Note on the Growth of Filarial Embryos in vitro..... 620
Quinine in Hemoglobinuric Fever..... 258

R.

Rapid Cure of Polyneuritis Gallinarum by Intramuscular Injection of a Substance Isolated from Rice.—By Creighton Wellman, Allan Eustis and L. C. Scott 295

Digitized by Google

Rat: A Sanitary Menace and an Economic Burden—The 414
Recent Research Relating to Undulant or Mediterranean Fever..... 806
Rectal Cancer in an Adolescent..... 883
Relapse in Malarial Infections..... 177
Relapsing Fever: The Relation of Temperature to the Appearance and Disappearance of Spirochaetae in the Blood..... 412
Relapsing Fever: Treatment by Salvarsan..... 413
Relapsing Fever Transmitted by Louse..... 185
Relation of Growth to the Chemical Constituents of the Diet..... 416
Relationship of Anaphylaxis to Immunity. A Preliminary Note.—By F. B. Gurd..... 776
Remarkable Emaciation in a Case of Hookworm Disease.—By Alfred Moore..... 294
Report of a Case of Long-standing Amebic Abscess of Liver and Lung.—By Allan Eustis 520
Researches on Pellagra..... 181
Review of a Clinical Study of Malarial Fever in Panama..... 335
Rheumatic Malarial Fever.—By Nathan Barlow 865
Rice in the Diet of Americans.—*Editorial*..... 427

S.

Sanitation and Tropical Agriculture.—*Editorial* 264
Schochet, S. S.; Wellman, Creighton, and Eustis, Allan.—Malta Fever in Louisiana 393
Scott, Leonard C.; Wellman, Creighton, and Eustis, Allan.—Rapid Cure of Polyneuritis 295
Serums and Vaccines in the Prevention and Treatment of Undulant Fever.—By A. P. Hitchens..... 228
Sinclair, A. N.—Epidemic of Paratyphoid (Origination from a Carrier and Dissemination by Vegetables)..... 612
Smith, Allen J., and Denny, O. E.—Agamomermis restiformis (Leidy), Stiles, from the Human Urethra..... 281
Smith, J. E.—Note on Pinta..... 402
Some Attempts to Transmit Trypanosoma gambiense by Wild Stomoxys; with a Note on the Intestinal Fauna of these Flies 412
Some Educational Methods for Use in Antimalarial Work—By H. R. Carter..... 848
Some Features of the Physiological Activity of Americans in the Philippines.—By W. P. Chamberlain..... 12
Some Further Remarks on Beri-beri.—By Edward B. Vedder..... 826
Some Results of Measures taken against Beri-beri in British Malaya..... 656
Some Thoughts upon the Prevention of Malaria and its Relation to the Drainage of Swamps and other Collections of Water.—By Isaac W. Brewer..... 861
South African Anti-Malarial Association.—*Editorial* 823
Splenic Abscess in Malarial Cachexia..... 259
Stable Fly—The..... 418
Stage in the Migration of the Adult Tertian Malarial Parasite. Evidence of the Extracellular Relation of the Parasite to the Red Cell..... 885
Stitt, Edward R.—Value of a Course in Tropical Medicine for the Training of the Internist..... 6
Studies on Goitre..... 414
Successful Campaign against Bubonic Plague in Mexico..... 659
Suggestions on the Annual Report of the City Health Department.—By W. H. Deaderick 573
Surgical Treatment of Elephantiasis and Elephantoid States.—By Rudolph Matas..... 60
Suspected Organism of Erythema Multiforme 187
Syphilis among the Chinese..... 527

T.

"Tamne," Human Myiasis of the Touareg of the Saharan Mountains Identical with "Thimni" of the Kabyles, due to Oestras ovis..... 473
Tardy Appearance of Abscess of the Liver Following Dysentery..... 257
Tenny, Elmer S.—Some Observations on the Prevalence of Intestinal Parasites in the Philippine Islands..... 44
Thymol as a Remedy for Tape-worm..... 600
Transmission of Cholera to Monkeys through the Gastro-Intestinal tract..... 473
Transmission of Spirochaetes..... 473
Transmission of Trypanosoma gambiense by Mosquitoes (Mansonia uniformis)..... 413
Transmission of Verruga by Phlebotomus..... 474
Treatment and Teaching of Syphilis.—*Editorial* 754
Treatment of Amebic Dysentery by Emetin..... 474
Trichonocardiases—The 741
Tropical Diseases in Palestine..... 101
Tropical Medicine and Medical Missions.—*Editorial* 428
Trypanosoma americanum..... 594
Trypanosoma rhodesiense and T. gambiense.. 100
Trypanosomiasis Treated with Sudyl and Galyl 808
Typhus in the United States..... 103
Typhus on Ships..... 528

U.

Ulcerated and Swollen Gums in Indian Troops 656
Ulcerous Colitis Due to Lamblia intestinalis. Perforation. Death..... 334
Ulcus interdigitalis foetidum.—By Nathan Barlow 868
Unpolished Rice and the Prevention of Beriberi 744
Urolithiasis and Bilharziasis..... 184

V.

Vedder, Edward B.—Some Further Remarks on Beri-beri..... 826
Von Ezdorf, R. H.—Malarial Investigations in the United States by the U. S. Public Health Service..... 855

W.

Way to Vaccinate—The—By Isadore Dyer.... 447
Wellman, Creighton, and Bass, C. C.—Polyneuritis Gallinarum Caused by Different Foodstuffs 129
Wellman, Creighton; Eustis, Allan, and Schochet, S. S.—Malta Fever in Louisiana 393
Wellman, Creighton; Eustis, Allan, and Scott L. C.—Rapid Cure of Polyneuritis Gallinarum by Intramuscular Injection of a Substance Isolated from Rice..... 295
Wellman, Creighton, and King, H. D.—List of the Mosquitoes hitherto Reported from New Orleans..... 267
White Race and the Tropics.—By Juan Guiteras 159
Whitmore, Eugene R.—Free-living and Parasitic Amoebae and their Relation to Dysentery 197
"Wholesale" Treatment of Cholera—The..... 418
Woolley, Paul G.—Beri-beri..... 711
Cultivation of the Bacillus of Leprosy: A Review 580

Y.

Year's Anti-malarial work at Khartoum..... 335

Z.

Zambesi Fever..... 101

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

3 2044 081 509 846

Digitized by Google